Gas Journal

VOL. 281. 107th YEAR. LONDON, JANUARY 19, 1955. No. 4781. PRICE 1/3

TECHNOLOGY DEPT.

This is the man who relies on Potterton Boilers

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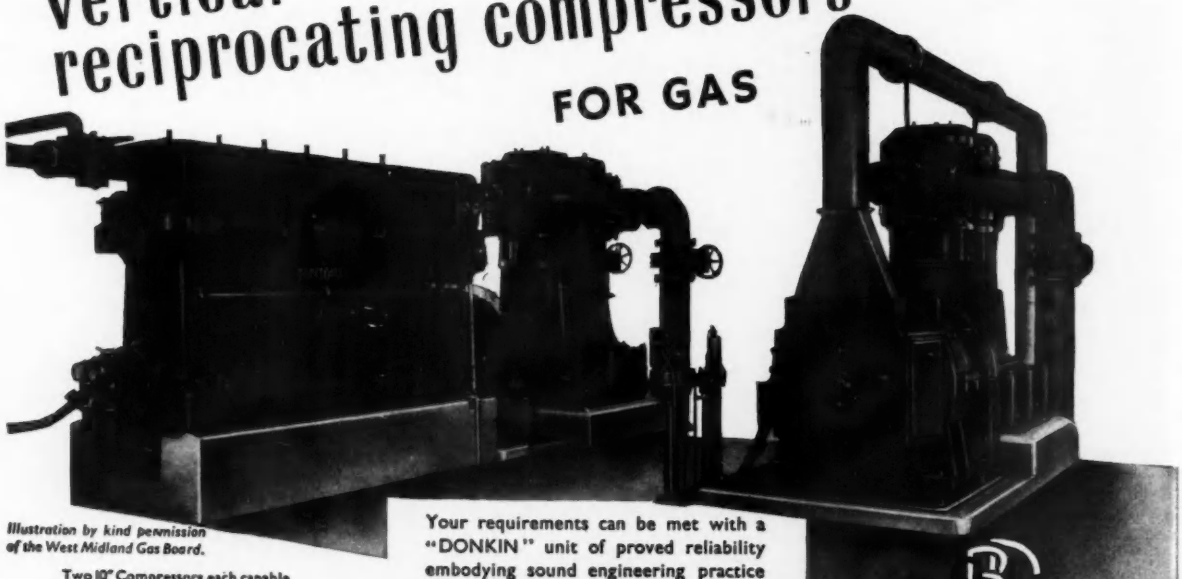

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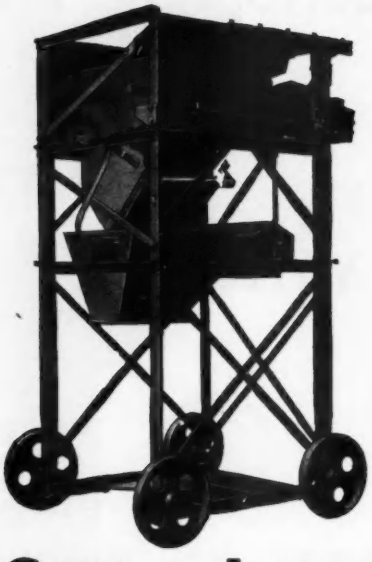

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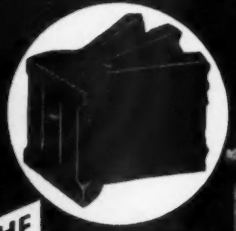

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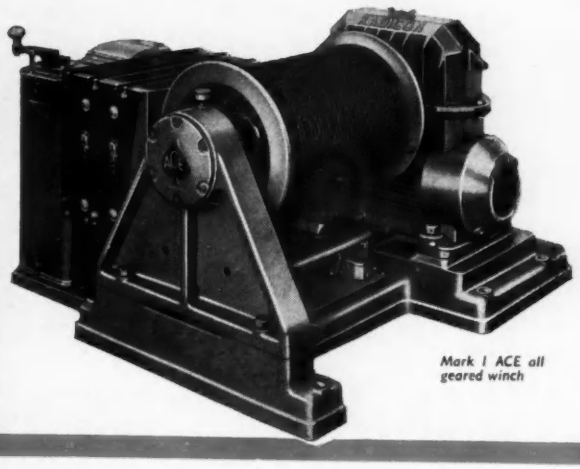

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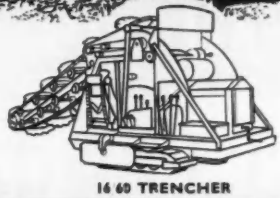

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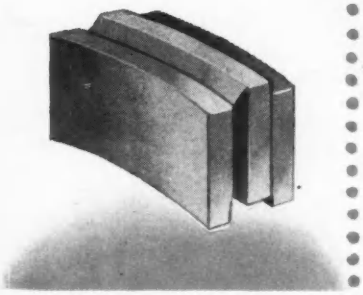

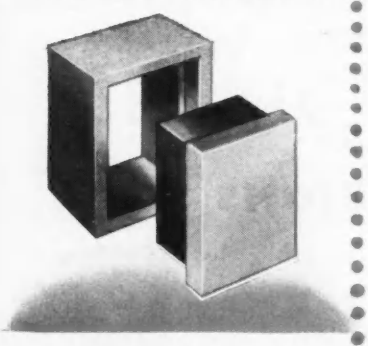

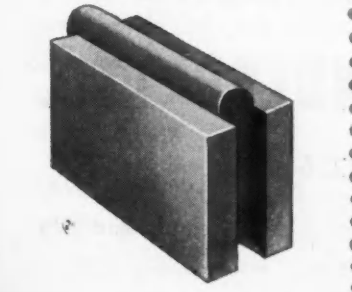

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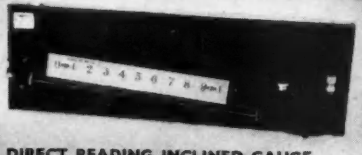

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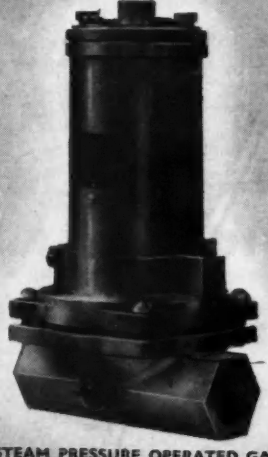
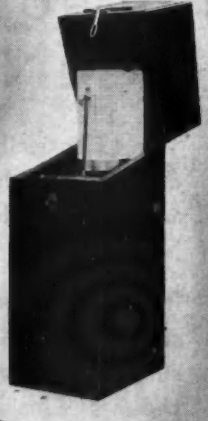


STEAM PRESSURE OPERATED GAS CONTROL VALVE

RELAY VALVE



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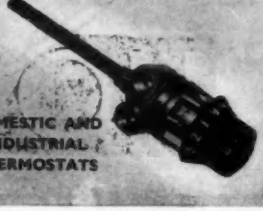

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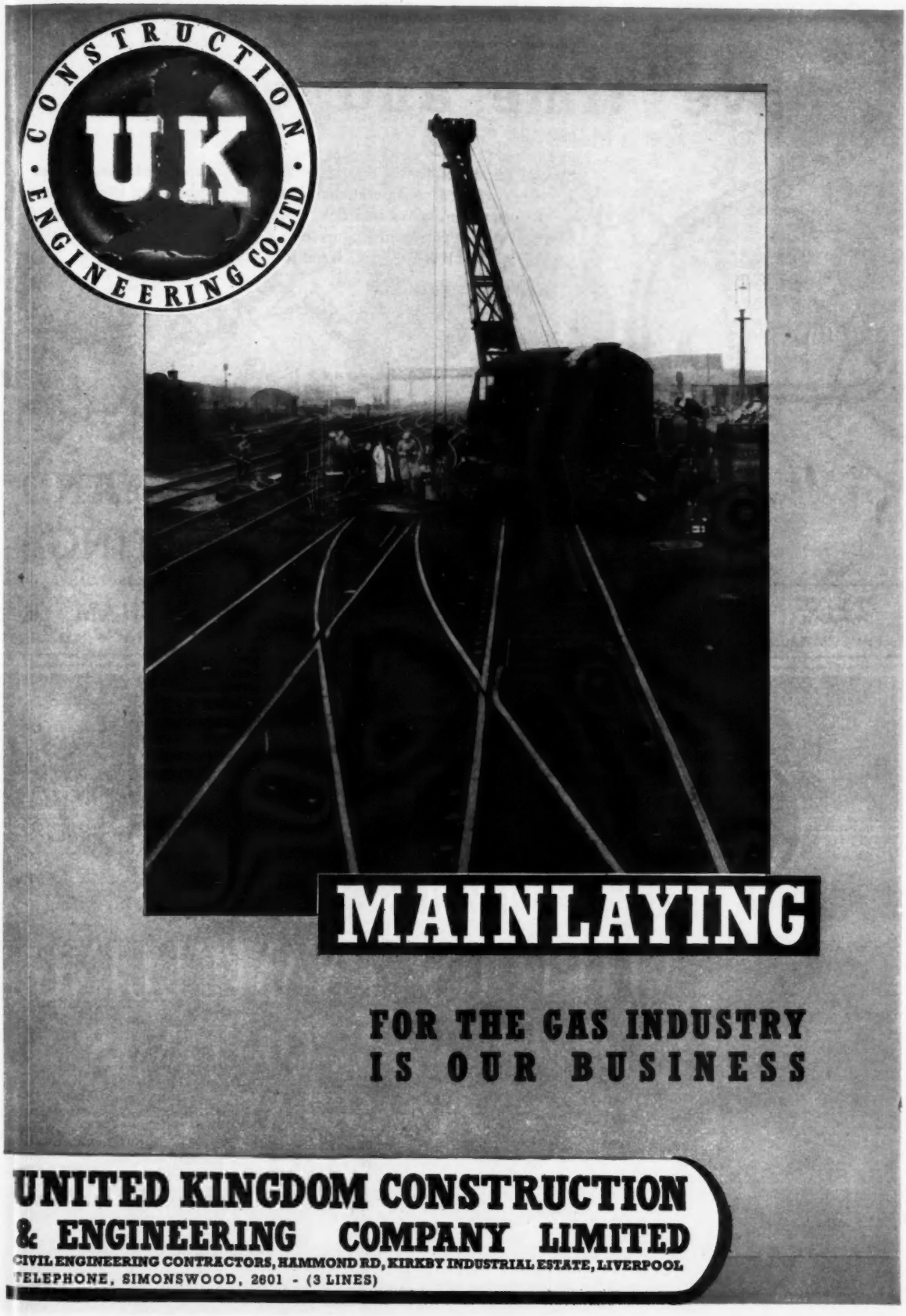
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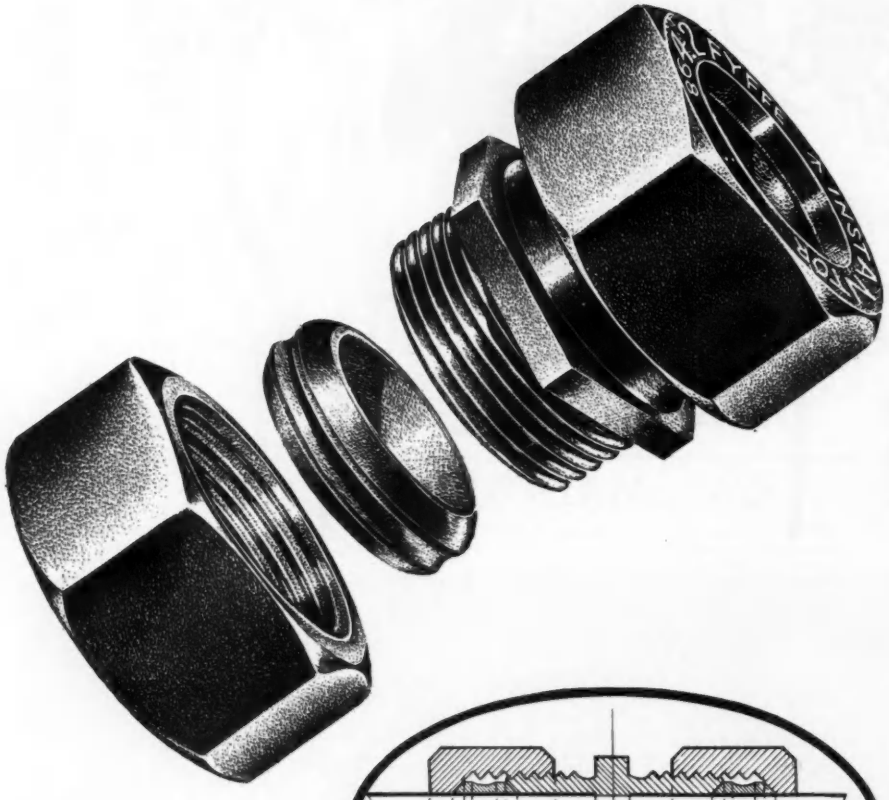

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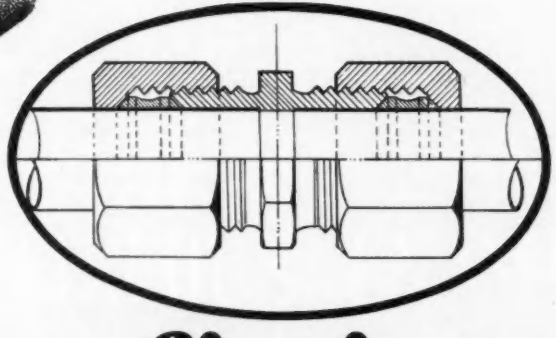

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I.C.I. make a complete range of Fyffe compression and capillary fittings in the "CONEOR", "INSTANTOR" and "INTEX P.T." patterns. For trouble-free service specify a Fyffe fitting.

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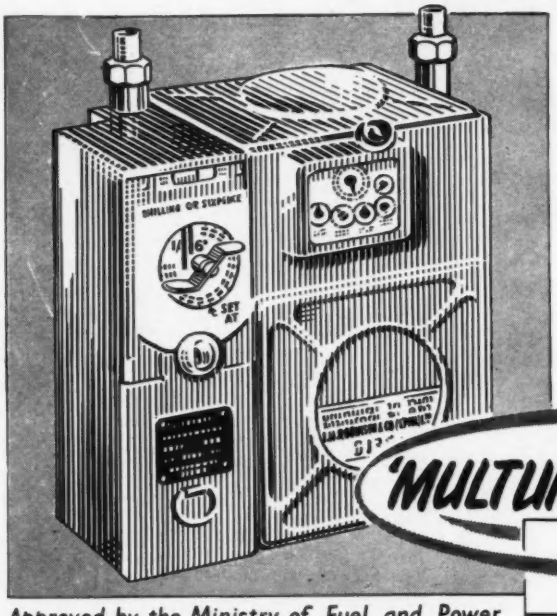

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Approved by the Ministry of Fuel and Power

	DIMENSIONS: ¾" connections		
	Overall Height	Overall Width	Depth Front to back
ORD.	10 21/32"	8 1/2"	6 1/8"
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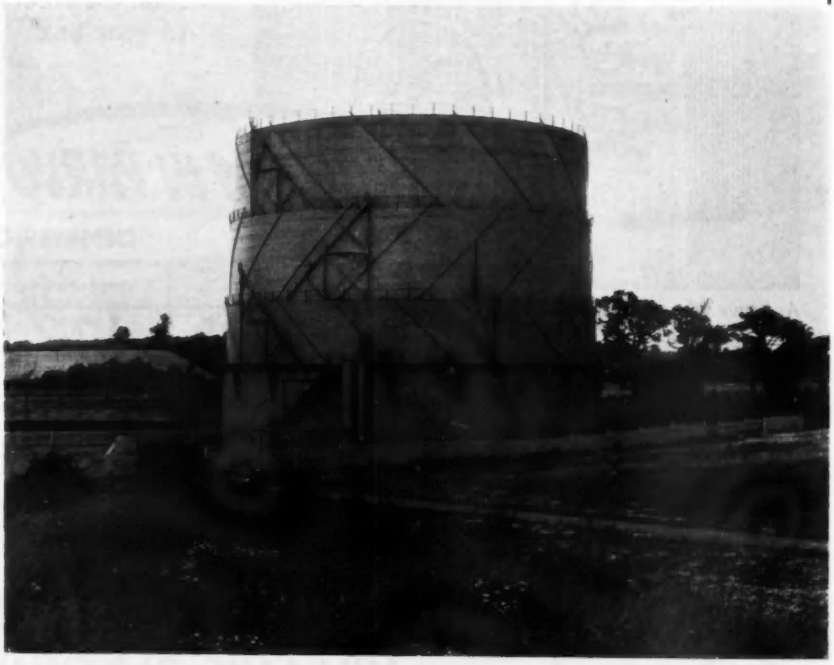

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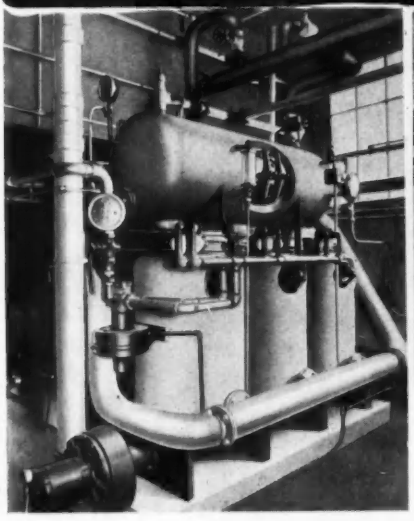
THE "VESTA" & "VERTEX" GAS FIRED BOILERS



Photographs by Courtesy of Wembley Stadium, Ltd.

WEMBLEY STADIUM

The Boiler Plant consists of TWO B.3 "VESTA" GAS FIRED BOILERS fitted with horizontal overhead steam drums, having a total capacity of 1,350,000 B.T.U.'s per hour.

The plant supplies low pressure steam for heating two plunge baths direct and, through calorifiers, hot water for wash basins, showers and baths in the New Dressing Rooms of the Main Sports Arena.

Consulting Engineers: Sir Owen Williams & Partners
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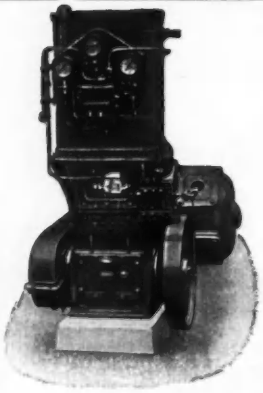

HIGH PRESSURE GAS COMPRESSORS *for*

pressures up to 5,000 lbs. per sq. in.

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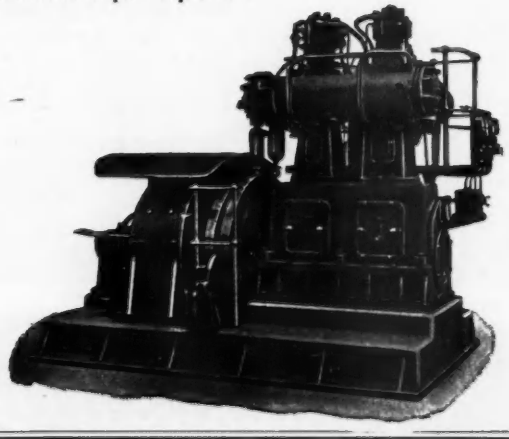

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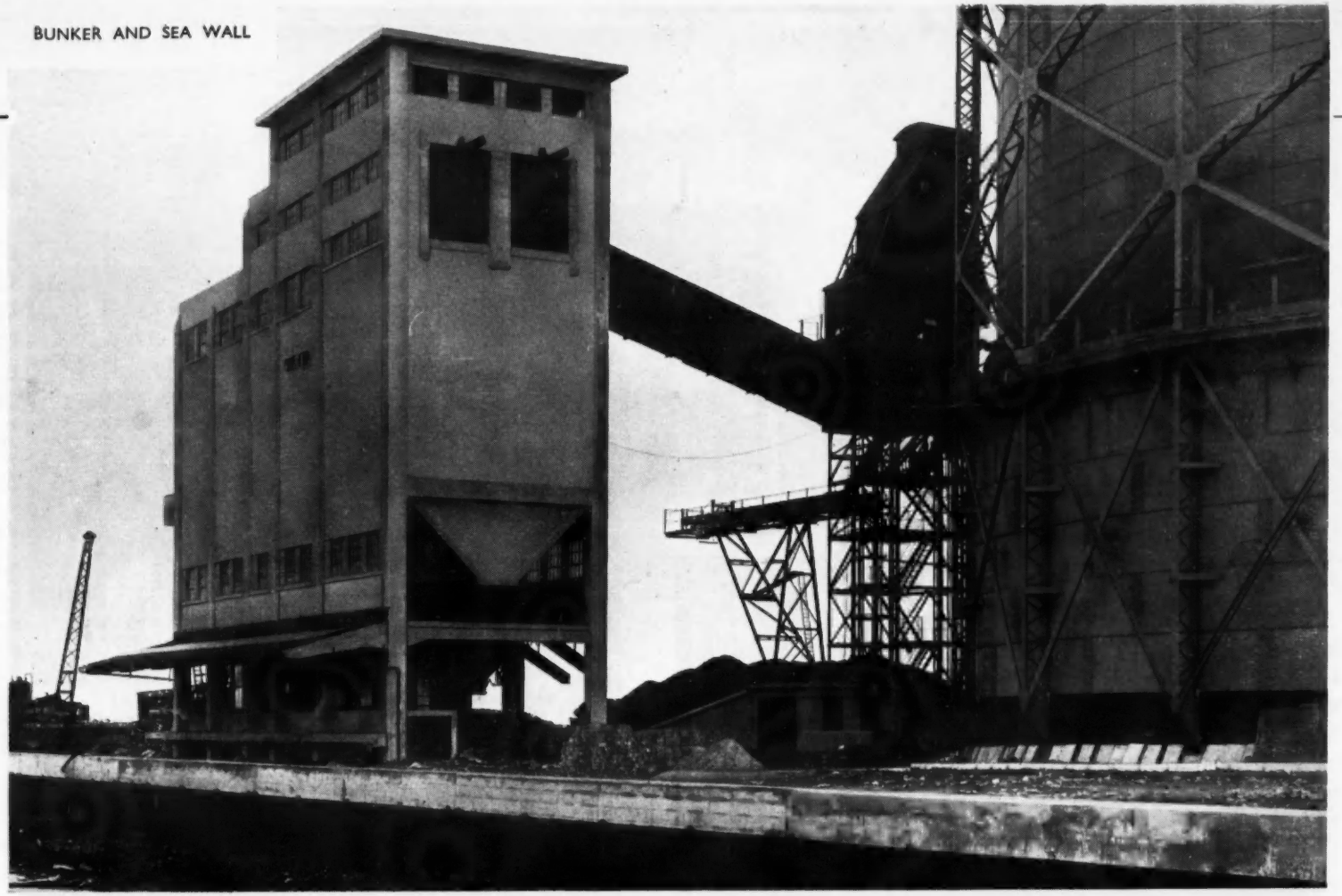

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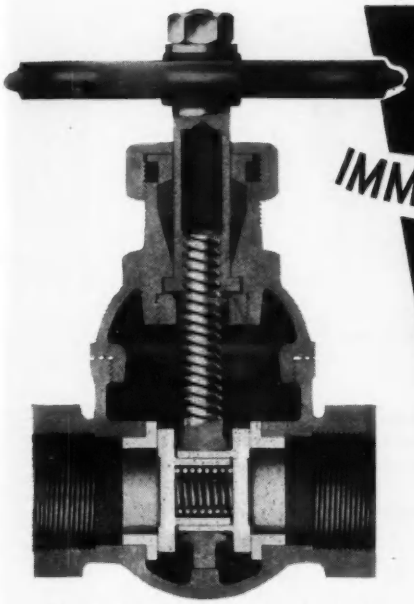

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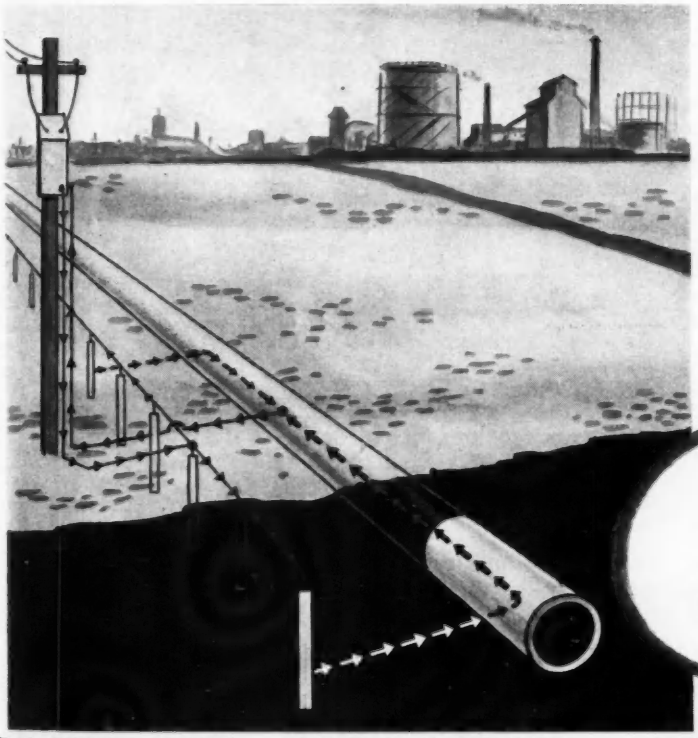

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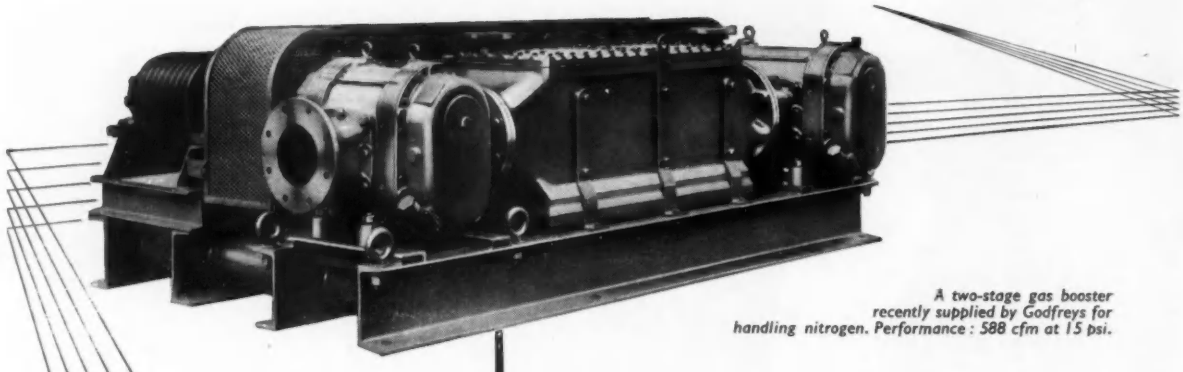

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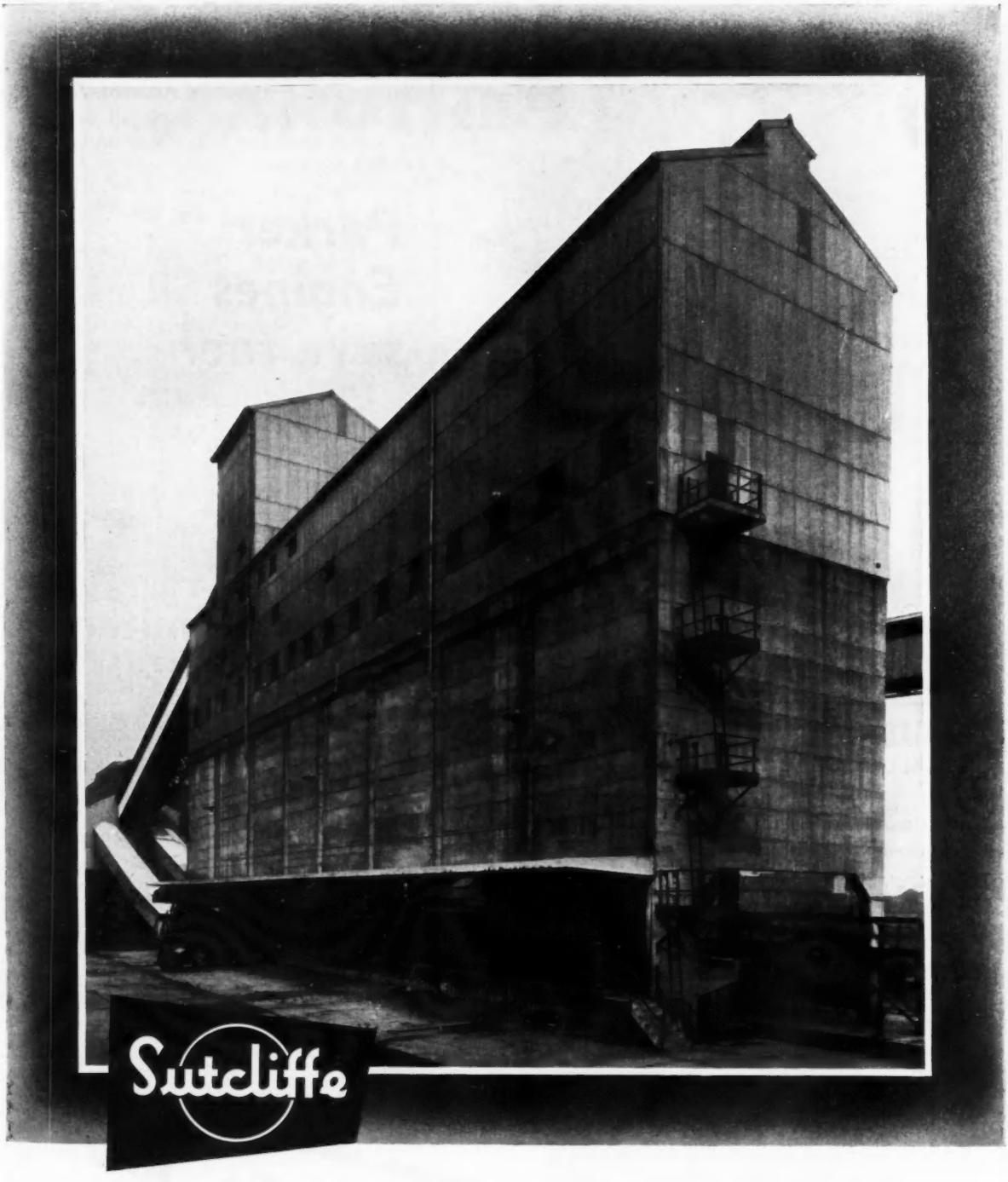

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At the Bromley-by-Bow works of the North Thames Gas Board, 15 Sutcliffe belt conveyors carry coke from the retorts through the screens to the bunker house illustrated above.

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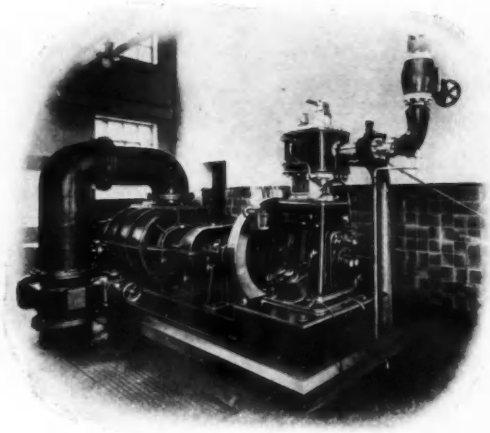

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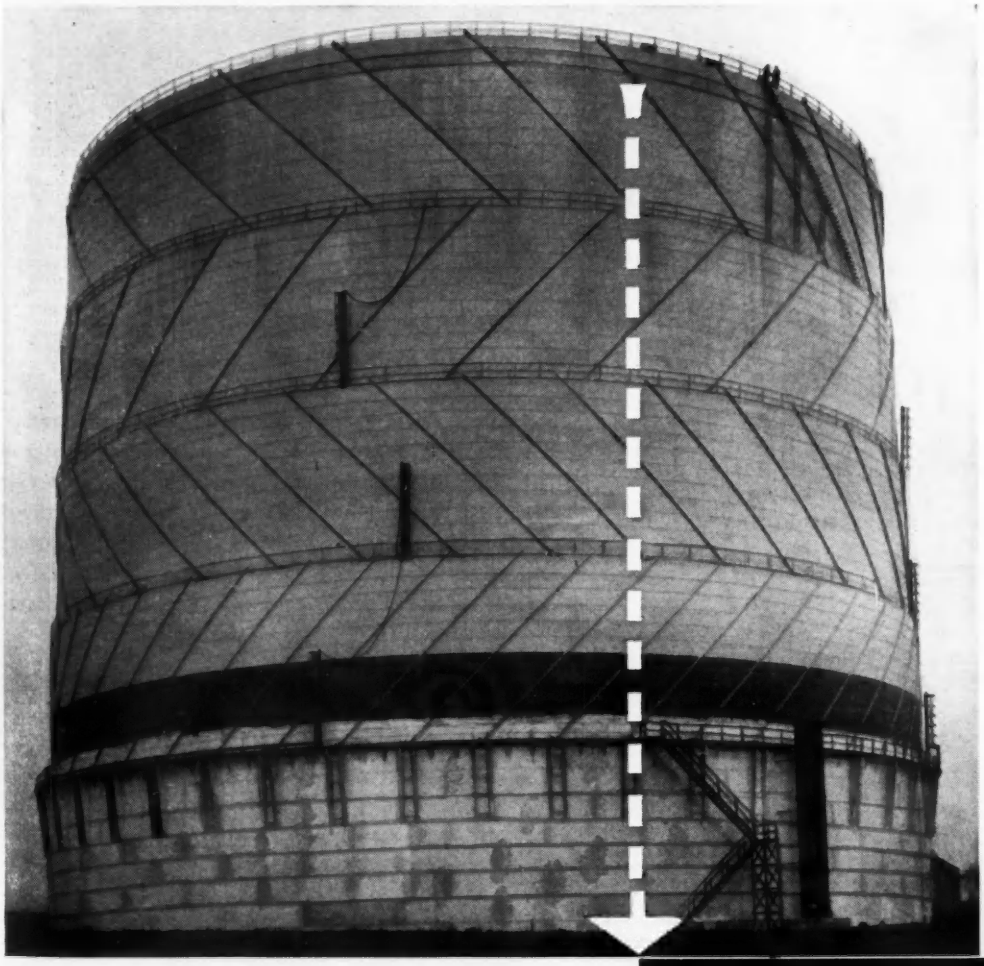

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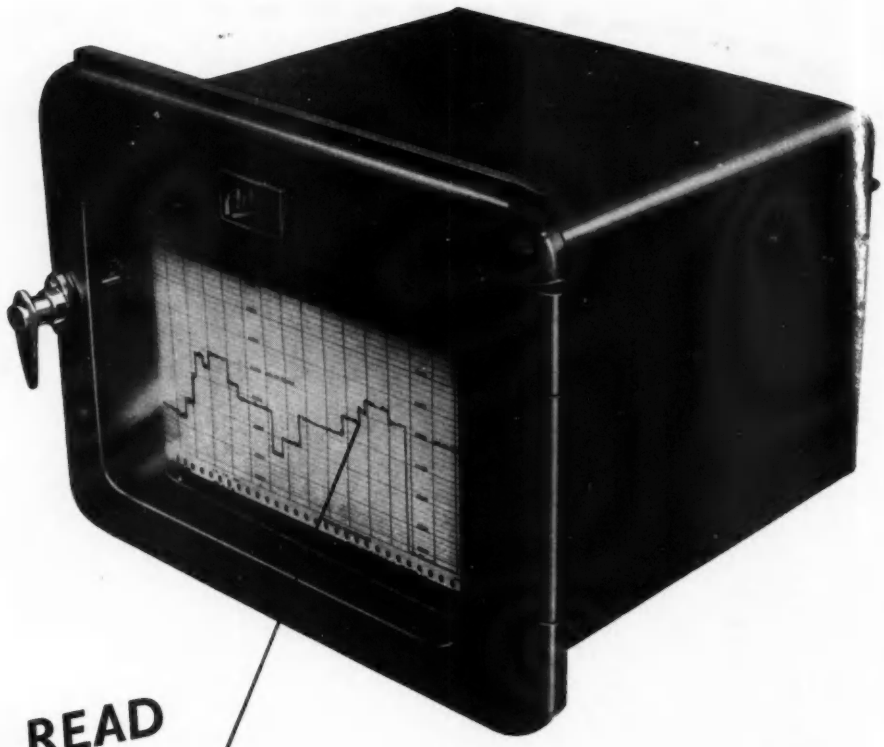

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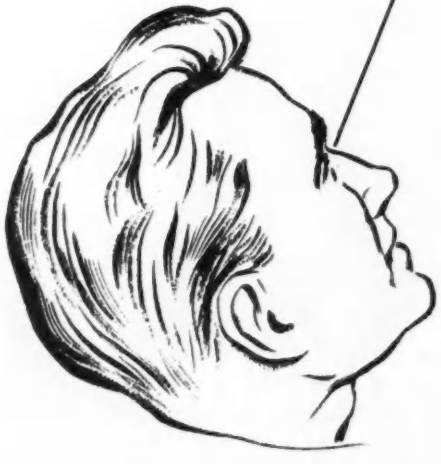

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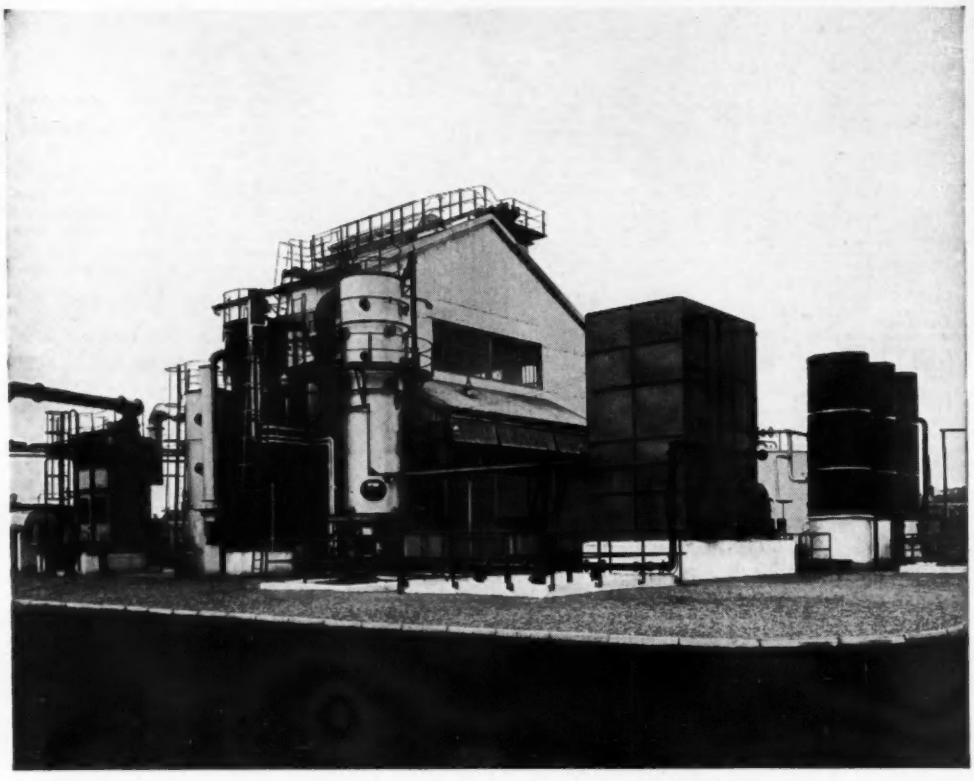
ONIA-GEGI PROCESS



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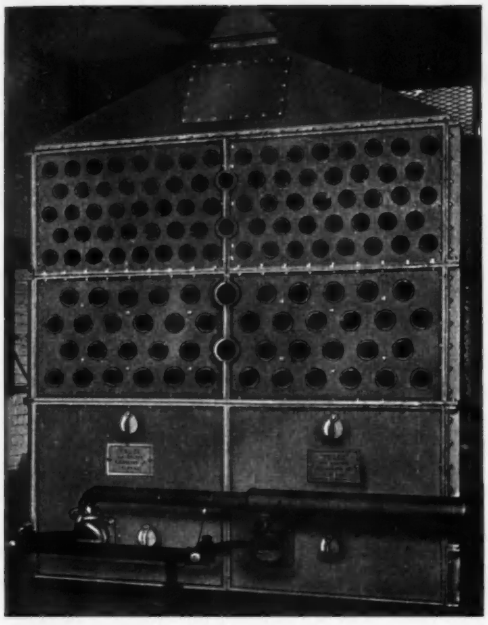

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PUBLISHERS' NOTICE, SEE JANUARY 12, 1955

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(October-December, 1954)
Inside Back Cover

Gas Journal

VOLUME 281. No. 4781. JANUARY 19, 1955. 107th YEAR

Safety in the Home

SOME of the most interesting sound broadcasts of the B.B.C. are the so called 'feature' programmes which can often be heard on the Home Service, that typically British, middle-of-the-road response to the widely varying demands of the listening public. The Home Service is an ideal medium for the purpose which the B.B.C. has in mind for producing and broadcasting these programmes, namely the 'highlighting' of some current problem affecting the whole nation or the development and explanation of some matter of unusual or topical interest. Whichever of these two categories the 'feature' falls into, it is always both entertaining and instructive. In our own case it is sure to be one of the items which are underlined in red in our own copy of the *Radio Times*.

As a result of our interest in this type of programme, we heard on Friday evening last a feature concerning the ever-present problem of accidents in the home. This dramatisation, which lasted three-quarters of an hour, was entitled 'The Killer You Live With' and was in the nature of 'a programme about the preparation of a programme'. It was prepared with the collaboration of the Royal Society of the Prevention of Accidents and other interested bodies, including the Gas Council. No doubt many of our readers will have heard the programme and will join with us in congratulating the B.B.C. on providing a really thought provoking study of the many ways in which men, women and children are injured at home, also for explaining the simple precautions that can help reduce the appalling number of these domestic mishaps. It is right that, from time to time, we should be jolted out of our complacency about this type of hazard. All too often we think of an accident as something that happens at a factory or on the roads, but never in the security of our own four walls; and of course, it always happens to the other fellow and never to ourselves. The figures quoted during this particular broadcast were as striking as they were sobering—every year, nearly 2 mill. people are sufficiently badly injured to warrant hospital treatment. Enough, and more than enough, to make every thinking person enquire into the causes of these accidents and to seek a remedy.

During the course of 'The Killer You Live With' it was shown that certain types of accidents are particularly frequent in the home; these are in order of frequency of occurence—falls, burns and scalds, suffocation, and gas poisoning, and it is with the last category that we are particularly concerned here. In the October 20 issue of the 'JOURNAL' we devoted the first leader to an appraisal of an article written by an eminent medical man, Dr. K. Simpson, on the subject, 'The Danger of Accidental Carbon Monoxide Poisoning'. Our reason for commenting on this particular article lay in the fact that the author considered the gas industry to have fallen short of its obligations in regard to certain aspects of safety in the use of gas. On November 10, we returned to the subject following the publication of a letter from the Secretary of the Gas Council to Dr. Simpson refuting the charges laid against the industry and explaining the action which has been, and is being, taken to prevent accidents in the domestic use of gas.

It was a good thing, therefore, to hear from the Gas Council again in Friday night's programme. On this occasion, the industry's case was put by Mr. K. Sheppard, of the Gas Council Press and Information Office, who intervened in the preparation of the script for the imaginary programme by means of a telephone call to the narrator, Stephen Grenfell. Mr. Sheppard said that he had heard that a programme was being prepared on the subject of accidents in the home, and thought that he ought to put his 'oar' in. This he did in a most effective manner, explaining in simple terms how the gas industry is doing all in its power to ensure that gas appliances are as near foolproof in operation as human ingenuity can make them. He mentioned the invaluable work carried out at Watson House in the testing and approval of new appliances; he also outlined the industry's efforts to see that appliances are fitted with safety taps and automatic ignition. In connection with the gas fire, it did seem to us that the provision of guards might have been mentioned, for although safety taps and automatic ignition together can prevent the escape of raw gas, they do not afford protection against burns. Quite rightly emphasis was laid by Mr. Sheppard on the fact that the gas industry is endeavouring to eliminate the danger of the common meter; as he said, no Board will fit one, and whenever a Board gets to know of one it has it taken out at the earliest possible moment. Finally, the Gas Council spokesman referred to the Home Safety Advisors which the industry employs to visit people's homes, post-natal clinics and other similar institutions, explaining the right way to use gas

appliances. Altogether Mr. Sheppard made excellent use of the few minutes at his disposal. Electricity was represented on this programme by a spokesman who took the listeners for an imaginary tour of the British Electrical Development Association laboratories, explaining meanwhile the measures taken by his industry to reduce the number of accidents in the home due to electricity. Gas and electricity may be in competition in many spheres but here they share a common and worthwhile objective, the protection of the public safety.

SUNDAY'S SMOG

VARIOUSLY described as 'a peasouper rolled up into a black pudding' (by the television weather expert), 'a rare but not unique phenomenon' (by the Air Ministry), 'a very rare and interesting phenomenon' (by the Meterological Office), 'a pillar of smog,' and 'darker than the darkest war-time blackout,' a blanket of black, sooty-smelling fog passed over London shortly after midday on Sunday and finally dispersed at sea two or three hours later after passing over Hastings. Monday's newspapers carried stories of alarm on the part of householders, of birds going to roost and of dogs whimpering, of people talking of the end of the world and the after-effects of hydrogen bombs, side by side with an official explanation that the cloud was made of smoke that had built up into a dense bank a mile or two wide just north of London and had then been driven back by a northerly wind. It could not escape upwards because the higher air was warmer than the cloud, and its base was kept clear of the streets by warm air rising from the houses. Whatever the true technical explanation may be, the fact remains that on a day when industry was resting there was sufficient domestic smoke to cause one of the worst blackouts in memory. It came a little over two years after the great London smog that resulted in thousands of deaths, a few months after the publication of the Beaver Report on Air Pollution, and a few days before the second reading of Mr. Gerald Nabarro's Bill which seeks to implement some of the recommendations contained in the Beaver Report. It occurred in the midst of a very cold spell, when gas undertakings were setting up new records of output and most householders were employing every available means of warming their homes—at a time of the day when the gas cooking load was at its peak, and marginal pressures were not as great as might have been wished. Recent road repairs in north-west London have thrown quite a lot of tarry wood road blocks on to the market, and many people who would have preferred to use only labour-saving smokeless fuels were stoking up with such blocks and with coals of indifferent qualities. The only thing we can say in favour of the smog is that it was timely so far as the consideration of the Committee's and Mr. Nabarro's proposals are concerned.

ENGINEERING PRACTICE IN THE GAS INDUSTRY

MR. T. ANDREWS, of the Liverpool Group, North Western Gas Board, presented a paper under this title to the Manchester Association of Engineers on January 6. It is always a difficult operation to get over to a body of 'laity' in a short time, an adequate idea of gasworks methods and practice, but Mr. Andrews came near to success. We were greatly impressed by the way he went about it. He had written the whole story out—a short introduction setting out the position of gas in the coal economy of the nation, a brief statement of the theory of carbonization followed by descriptions of the several methods bringing out their differences, heating systems and results, waste heat recovery by recuperators, regenerators and boilers, with a mention of the gas turbine, cooling, washing and purification, wet and dry. Exhausting and boosting machinery were described in somewhat greater detail—as likely to interest a general engineering audience. And finally, a short section on distribution and supply.

But Mr. Andrews did not just read all or even a part of this. He re-told the story in a lively, personal, smiling manner which captivated his audience, and he followed his address with the exhibition of a few slides. The discussion was perhaps as good, or the reserve, as one expects on these occasions. Quite a few questions related to the Rochdale process, and these Mr. Andrews dealt with intelligently but with a praiseworthy reticence. The driving and governing of exhausters and boosters received a good deal of attention, and one gentleman had to be told something of the differences between one coal and another. The speaker was moderately well supported by colleagues in the gas industry, but it must be said that at any rate in Manchester the gas industry is not too well represented at meetings where fuel or even gas is under discussion.

THE POWER OF LIGHT

THIS, so it is said, is an age of enlightenment. Certainly it is one in which an enlightened view is at last being taken of the importance of lighting in the business of selling. Oddly enough, it is only in quite recent times that the range of lighting fittings available for showrooms has been such that almost any effect is possible and that lighting alone can make an effective contribution to the sale of almost any commodity. Lighting is now high on the list of sales aids, and failure to appreciate its importance can only result in an inability to keep up with more enlightened competitors. The gas industry, in striving for its share of the public's money, must realize that its problem is not just one of persuading a person to buy a gas cooker instead of an electric cooker. The gas cooker is in competition also with the television set, the new suite of furniture, the fur coat, the lawn mower, and the power-assisted bicycle. It is not safe simply because it is a necessity. Irrespective of the fact that an electric cooker may be chosen in preference, there is always the danger that an already old and out-dated gas cooker may be allowed to continue in harness for several more years, and the owner's money used to procure one of the other items listed above.

For this reason the gas showroom and its windows must exercise an appeal not less than the drapers', the furriers', the radio shops, and so on. Good displays help, but the best displays in the world are powerless if their light is hidden under the proverbial bushel. The provision of showroom lighting is a matter for expert advice. It is not a job which can be entrusted to any architect and certainly not to the local sales manager. Good lighting can make the gas showroom shine like a beacon among neighbouring premises; it can make the consumer *want* to enter through its portals and suggest a warm welcome and sympathetic service; it can make an appliance look twice as good as in ordinary daylight. For this reason we were pleased to note editorial recognition of this fact in a recent issue of 'GAS SERVICE' and we now understand that lighting is to form the subject of a special article to be published shortly in that journal. It is to be hoped that whatever words of wisdom emerge, they will not fall on stony ground. This is something about which we just cannot afford to be complacent or disinterested. Showroom lighting and selling must be considered as close partners.

Correspondence

CHEQUE ENDORSEMENT

SIR,—May I suggest with all respect that Mr. Alexander's letter dealing with the use of crossed bearer cheques would have been more understandable, and therefore more convincing, to the bulk of your readers if he had made clear what is meant by the term 'negotiable.'

In connection with the rights of the parties to a bill of exchange, of which a cheque is an example, the word 'negotiable' has a specialized meaning, and I am quite sure Mr. Alexander could make this meaning clearer to your readers than can—Yours faithfully,

N. H. DAVIES.

26, Park Avenue,
Woodford Green,
Essex.
January 11, 1955.

CATALYTIC CONVERSION OF BUTANE TO TOWN GAS

Sir,—In the paper on the catalytic gasification of petroleum oils (Communication No. 457), presented at the last Autumn Research Meeting of the Institution of Gas Engineers, mention was made of the possible application of the process to other raw materials of the petroleum industry, and the intention was expressed of carrying out full-scale experiments on the Sydenham plant with some of the liquefied hydrocarbon gases which had yielded promising results in laboratory tests.

Experiments extending over a period of about a month have now been completed at Sydenham, using liquid butane as raw material, and it is of interest to note that the results obtained fully confirm the deduction made from laboratory tests that there should be no difficulty in converting these lighter fractions from petroleum to a town gas of suitable calorific value and density. With little change in the cycle of operations on the plant it has been found possible to obtain from butane a gas of 500 B.Th.U. per cu.ft. calorific value, having a specific gravity as low as 0.46, and this has been achieved not only with a higher overall efficiency than is possible in the gasification of the heavier petroleum oils but also with some promise of an appreciably increased output of gas per unit of plant.

It is hoped that this additional information, indicative of the wide range of petroleum products susceptible to successful treatment by the catalytic process described in the paper, may be of some interest to members of the industry.

Yours faithfully,
H. STANIER,
Chief Chemist,
South Eastern Gas Board.
January 14, 1955.

Meters, Ltd., have changed their Bristol branch address to a new factory, which was recently completed. The new address is Brislington Trading Estate, Bath Road, Brislington, Bristol, 4. (T/N Bristol 76721.)

Personal Notes

MR. F. E. KNIGHT, ASSOC.INST.GAS E., formerly Technical Assistant (Mains) at Bournemouth, has been appointed Assistant Distribution Engineer to the Portsmouth, Gosport, and Bognor Regis undertaking of the Southern Gas Board.

MR. L. F. PARSONS has been appointed Technical Sales Representative of Jenolite, Ltd., Rathbone Street, W.1, for the London area. Formerly with Odhams Press as sales supervisor in the Manchester area, Mr. Parsons was also for three years maintenance engineer at the American Embassy (Mutual Security Agency).

MR. W. E. KING, a well known personality in the gas lighting industry, retired at the end of 1954 after over 40 years with the Parkinson and Cowan Group of Companies. To honour this a small luncheon party was given on December 22 at the Chez Auguste Restaurant, Old Compton Street. The

Mr. R. J. Rogers (left) making the presentation to Mr. King

guests included senior officials of the Parkinson and Cowan Group and representatives of the lighting departments of the gas authorities in the London area. The chair was taken by Mr. R. Connor; and Mr. R. J. Rogers made a presentation to Mr. King on behalf of his colleagues. As a token of esteem officials of the North Thames Gas Board presented Mr. King with a Ronson table lighter.

MR. CYRIL MARKS PLOWMAN, Adviser to the Industrial Relations Committee of the Gas Council, has retired through ill-health, and the gas industry has lost a loyal worker and friend. As a mark of appreciation for his 35 years of service to the industry, both sides of the National Joint Industrial Council for the Gas Industry and the National Joint Council for Gas Staffs presented Mr. Plowman with a canteen of cutlery. The presentation took place informally at his home on December 20. Mr. Plowman, who joined the gas industry in 1919 after serving in the Royal Navy, held many industrial relations appointments. During the second world war, Mr. Plowman visited Southern Ireland on a recruiting drive for labour for the industry. He was also a prominent member of the Home Guard at Gas Industry House. For service to the industry, Mr. Plowman received the M.B.E. in the 1953 Coronation Honours.

MR. J. SPENCER, Distribution Superintendent at Spalding, Lincs., for the East Midlands Gas Board, has left to take up a post at Chesterfield with the Clay Cross Co., Ltd. MR. HERBERT ASKEW, of Bourne, Lincs., Local Superintendent since the end of 1952, has been appointed Group Distribution Superintendent in charge of the sales and service organization at Spalding and Bourne. Beginning his career in the gas industry at Kirton, Lincs., in 1938, Mr. Askew was appointed foreman at Bourne in November, 1952, and became Local Superintendent in December when the Bourne Manager, Mr. J. Rose, retired.

MR. FRANK DYSON has been appointed by R. & A. Main, Ltd., as the General Manager of Gothic Works, Falkirk. Mr. Dyson served his apprenticeship as a mechanical engineer with J. Blakeborough and Sons, Ltd., of Brighouse, and later continued with them as a designer. He was afterwards engaged with Gummers, Ltd., of Rotherham, and Fawcett, Preston and Co., Ltd., of Bromborough, in executive capacities, and qualified as an A.M.I.MECH.E. Joining R. & A. Main, Ltd., at Falkirk in 1938 as assistant to the Works Manager, Mr. Dyson was, as a member of the Army Reserve, called to the colours in September, 1939, serving in France, North Africa, Sicily, and Italy with R.E.M.E., being demobilized at the end of 1945 with the rank of Major. On his return to R. & A. Main, Ltd., Mr. Dyson was appointed Works Manager, and in 1951 became Assistant General Manager to the late Mr. G. W. Wortley. MR. W. P. RAE will continue as Northern Sales Manager, operating from 82, Gordon Street, Glasgow.

MR. R. S. HOWE, Sales Superintendent of the Parkinson Stove Company, Ltd., has been appointed Commercial Manager. He commenced his career with the gas industry in 1934 when he joined John Wright & Co., Ltd. During

the war he served with the North Staffordshire Regiment and the R.A.S.C. He joined the Parkinson Stove Company in 1951 and was appointed Sales Superintendent in January, 1953. He is a member of the Incorporated Sales Managers Association (Bronze Medallist, 1951).

OBITUARY

ALEXANDER TRAN

With deep regret we record the death of MR. ALEXANDER TRAN, General Manager of the Northern Division of the Southern Gas Board, which occurred suddenly on January 14. He appeared to be recovering quite well from an operation, and the news of his death came as a great shock to all who knew him. Mr. Tran was educated at North Kelvinside Higher Grade School and at the Royal Technical College, Glasgow. Preparatory to his apprenticeship as a gas engineer he served for two years with a Glasgow firm of measurers and surveyors.

He joined the staff of the Glasgow Corporation Gas Department in 1919, where he served for five years in the engineering and structural drawing office, and for three years in the workshops and laboratory of the Dalmarnock gasworks. In 1927 he was appointed Assistant Engineer and Manager to the Helensburgh Gas Department under Mr. David Fulton, and four years later he became Assistant Engineer and Manager to the Coatbridge Gas Company, under Mr. George Braidwood. Subsequently he crossed the Border and after serving for a time as Assistant Engineer and Manager under the Bath Gas Company he was appointed to a similar position with the Reading Gas Company.

Mr. Tran's appointment as Engineer and Manager of the Oxford and District Gas Company was made in 1940, and he became General Manager and Chief Engineer in 1944. Later in the same year, in addition to his responsibilities at Oxford, he was appointed a Director, General Manager and Chief Engineer of the South Midland Gas Corporation, which, until nationalisation, was in close touch with the Oxford and District Gas Company and controlled the Banbury, Eynsham, and Witney undertakings. On the nationalisation of the industry he was appointed General Manager of the Northern Division of the Southern Gas Board, controlling the Oxford, Aylesbury, and Banbury Groups.

From his earliest days in the gas industry Mr. Tran was an active member of the industry's organizations, and was President of the Scottish Junior Gas Association (Western District) in 1933. He had become a Corporate Member of the Institution of Gas Engineers in 1930, and he gained the Diploma of the Institution in 1932. He served on the Council of the Institution, and he also became a Member of the Institution of Mechanical Engineers and of the Institute of Fuel. His colleagues in the west of England were quick to recognize his qualities of leadership, and he became President of the Western Junior Gas Association in 1938. So far as the senior bodies were concerned, Mr. Tran was on the boundary of two district sections of the Institution of Gas Engineers—the Midland and the London and Southern, and almost as soon as he had completed his year of office as Chairman of the Midland Section he became a Vice-Chairman of the London and Southern. At the time of his death he was Senior Vice-Chairman of the latter, and would in the normal course of events have succeeded to the chair this year.

Mr. Tran had not been at Oxford long before he was faced with the problem of extending the present works or building a new works to cope with the

growing demand for gas in the district. Proposals for extending the works formed the subject of a public enquiry at which opposition was offered by the city and university authorities, and an appeal to Parliament resulted in the rejection of the scheme on the ground of local amenities. On behalf of the Board Mr. Tran set to work to find alternative means of meeting the demand. A bulk supply from Reading temporarily eased the situation, but Mr. Tran was still engaged on designing the construction of a new works on an acceptable site.

MR. HUBERT CECIL BOOTH, F.C.G.I., M.I.C.E., who died at Purley on January 14, aged 83, was until June, 1952, Chairman and Joint Managing Director of the British Vacuum Cleaner & Engineering Co., Ltd., which Company he founded over half a century ago following his invention of the vacuum cleaner in 1901. Mr. Booth, who received his engineering training at the Central Technical College, was for many years in practice as a consulting engineer, during which time he was responsible for the design and construction of a large number of important bridges both at home and overseas. He also played an important part in the design and construction of the Big Wheels at Paris, Vienna, Earls Court, and Blackpool in the early days of the present century. As the inventor of the vacuum cleaner, he gave rise to what was to become a world-wide industry. He enjoyed a host of friends, not the least of whom were the large number of people employed by the organization he founded. Not content merely with the domestic application of the vacuum cleaning principle, Mr. Booth applied the principle to a wide variety of industrial uses of value, not only in matters of hygiene but in the elimination of the hazards of industrial disease. A recent National Coal Board report referred to the use of vacuum cleaners in mines, the first experimental plant for which was designed by Mr. Booth as far back as 1907. During the first world war he designed special apparatus for use in dealing with high explosive powders.

ALDERMAN SIR WILLIAM KAY, for many years Chairman of the Gas Committee of the Manchester Corporation and a member of the City Council for more than 50 years, died on January 16 aged 86. His death severs a link with the long history of the gas industry in general and the Manchester undertaking in particular. He was appointed Chairman of the Gas Committee in 1912 and held the position for more than 16 years. He represented Manchester on the National Gas Council and the British Commercial Gas Association, and was the only citizen to serve as Lord Mayor of Manchester for three periods. He was knighted in 1922 for public services and was made a Freeman of the city in 1949. Sir William was appointed Chairman of the Waterworks Committee in 1928 and still held the position at the time of his death, the City Council having last year waived a regulation requiring the resignation of chairmen of committees after three years service in order that he might be chairman when the first pipeline from Haweswater was opened this year. He was also senior Corporation director and the Deputy Chairman of the Manchester Ship Canal Company.

The Cold Spell

Gas supplies have been taxed to the limit on Tyneside during the cold weather. In one 24 hour period 70 mill. cu.ft. of gas was used, but between 8 a.m. and 5 p.m. the rate of consumption was much higher. Gas pressure was severely affected, and in one restaurant at Newcastle-on-Tyne the gas heating system had to be switched off to allow better supplies of gas for cooking.

Gosforth Urban Council (Northumberland) has protested to the Northern Gas Board about inadequate gas supplies. For three days during the cold weather supplies were practically non-existent, it was stated. Owing to a fault at Hexham Gasworks, gas supplied to local consumers during the past three months has not been up to standard, and to compensate consumers, the Northern Gas Board is giving a rebate of a fifth of a penny for every therm used.

The spell of cold weather in Scotland resulted in a new production record at the Granton works, Edinburgh. On January 12 the output from the works was the highest ever. A total of 27,501,000 cu.ft. was sent out, which was just slightly more than the record set up for a Monday in January, 1952.

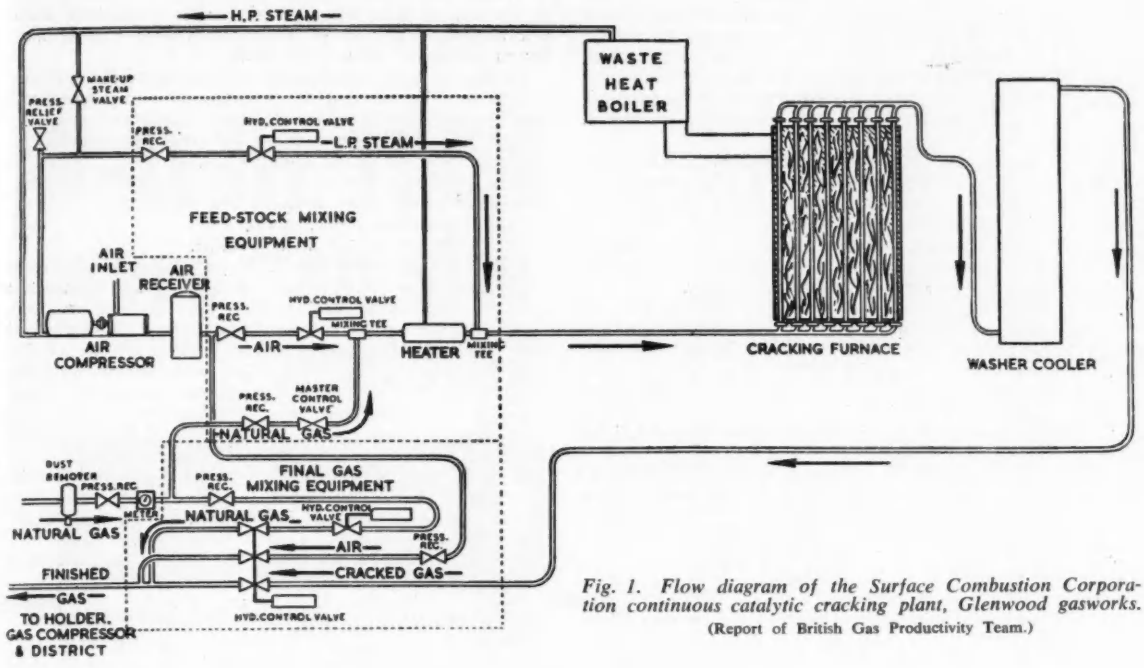


Fig. 1. Flow diagram of the Surface Combustion Corporation continuous catalytic cracking plant, Glenwood gasworks.
(Report of British Gas Productivity Team.)

*Gas Manufacture—A Global Survey**

By J. D. GRANT, M.A., ASSOC.M.INST.GAS E.†

THE amount of gas made by supply authorities compared with that obtained from other sources is widely different in different parts of the world. It seems appropriate, therefore, to enquire first of all as to the reason for this variation in proportion. The utilization of manufactured gas, and for that matter of natural gas, as was revealed by a Danish descendant of William Murdoch, started as an attempt to provide a better and more economical method of lighting.

Developments in this country, and in France by Lebon, were directed to the end of producing an illuminant. Supplies of suitable coal were easily obtainable and coke was regarded as a waste end-product. At the same time as gas light was gaining ground the industrial revolution in this country was in full swing, to the mutual benefit of both developments. The economic atmosphere of the time was in favour of private enterprise with consequent emergence of many small gas undertakings. The developing metal industries looked for coke but they required a hard abrasion-resistant material for mixing with their ores. This condition was not met by gas coke. Consequently a separate coking industry arose.

Metallurgical coke was first produced in the beehive-oven in which part of the coal charge was burnt with a limited amount of air in a refractory vessel. The heat so generated carbonized the remainder of the charge, but the only product of this procedure was coke. As the coke oven developed the natural course was to use the waste byproduct gas as the means of heating in the oven flues, any surplus being burnt to waste. A first refinement on the method was to remove from the crude gas valuable byproducts such as tar and benzole.

Later the idea emerged that the coal gas produced could be sold to the town gas suppliers, and a producer gas, made from the small, unsuitable coke grades, used for heating the ovens using regeneration. The use of the byproduct coke oven as a supplier of town gas gained much more rapid growth outside Great Britain, in those countries where the gas industry started later.

Where gas supplies have been established in other countries by British companies, notably in the Commonwealth and South America, British practice has been followed, although associated with special measures for tropical climates. The historical trends in the building-up of the manufacturing structure of the gas industry can be disturbed by two important factors—firstly, natural gas, and closely allied liquid petroleum gases. In the United States manufactured gas has now dwindled to two-thirds the production of Great Britain, and natural gas has expanded on a very large scale. Parts of the Low Countries are also entirely supplied by natural gas, some derived as methane drainage from coal mines.

The second important factor is the shortage of good coking coal; this is a problem rapidly growing in this country and faced somewhat sooner by other countries who have not found the salvation of natural gas.

Natural Gas

Natural gas, which is predominantly methane, where present in sufficient quantities to satisfy the market, becomes the interest solely of the distributing gas engineer, and the manufacturing gas engineer has to look for other fields. However, if natural gas is available only in limited quantities compared with the market the utilization engineer does not have a field day changing all appliances, except possibly in such districts as lend themselves to isolated working. The use of these limited supplies of natural gas depends on reforming techniques.

Reforming consists of a simple admixture with air, or by a cracking technique using air or steam followed by enrich-

* From a paper read to the London and Southern Junior Gas Association on January 7.

† North Thames Gas Board.

ment with neat gas to obtain the necessary calorific value. Natural gas/air mixtures have been used in Italy and France during change-over periods from coal gas supply to natural gas supply. Reforming of natural gas by thermal cracking results in a gas of about 200 B.Th.U. per cu.ft. requiring enrichment with neat natural gas; catalytic reforming produces a gas of about 300 B.Th.U. per cu.ft. requiring less enrichment.

In the United States, in those districts where natural gas is used as an additional source of supply to coke oven gas, a number of large scale cyclic and continuous, thermal and catalytic reforming plants have been developed. With the cyclic processes a normal water gas plant is used, passing the gas through the coke bed, or a catalytic plant similar to the ONIA-GEGI plant which will be mentioned later.

The continuous processes are rather more interesting in the structural problems that have been solved. The requirement is that the gas/steam/air mixture be passed through a catalyst bed maintained at the requisite temperature. The Hygirtol process uses vertical stainless steel tubes of 9 in. diameter, 30 ft. long filled with a nickel catalyst and operating between 800-1,000°C., heating being by natural gas in the brick-lined vessel containing the tubes.

The Surface Combustion Corporation Plant (title block) uses heat-resisting alloy tubes of 8 in. dia., 25 ft. long, operating at 1,000°C. with the nickel catalyst supported on pieces of an alundum rock. The Gas Machinery plant employs silicon carbide tubes in a similar manner. In this country nickel catalyst has been used at Whitehaven in adapted horizontal retorts for reforming methane from mine drainage. The use of the Segas and ONIA-GEGI catalytic oil cracking plants as natural gas reforming plants has also received attention.

Natural gas is being used for enriching and reforming to supplement coal gas in South America, where large supplies are available in the Venezuela oilfields. Some long distance transmission lines have been established.

Liquid Petroleum Gases

Propane and butane, which are obtainable from petroleum refineries, can be transported and stored as liquids. Propane boils at −44°F. and butane at 32°F., at atmospheric pressure. It is important to remember that both gases are denser than air (propane 1.52, butane 2.00). Apart from the use of bottled gases the commonest uses of these two gases are as enriching media for blue water gas in place of the more usual gas oil, and in gas/air mixtures or reformed by catalytic cracking.

As enriching media they possess the advantage over oil in that all that is required is a water gas generator and a liquid petroleum gas vaporizer. Control of calorific value is simplified and detailed control of oil cracking conditions is obviated. The gas produced is not entirely suitable for substitution for normal town gas but on a works producing a proportion (15%) of water gas together with coal gas it is quite satisfactory. This technique has been developed to a considerable degree in various areas of France, and to some extent for 'peak shaving' in the United States

Propane and butane/air mixtures are very suitable for distribution on small isolated systems but require the adjustment of the burning appliances set for coal gas. Little equipment is required at the manufacturing station and control can be fully automatic. The supply and storage of liquid gas is easily handled, but stringent fire precautions have to be taken.

In the United States such plants are used to a considerable extent for 'peak shaving' since such gas/air mixtures are readily interchangeable with natural gas. In France a number of areas are being supplied by this method and it is also being utilized in Denmark and in this country. Catalytic cracking of propane has been used on a small scale in France for producing a gas interchangeable with town gas.

Coal Gas

Having examined the effect of the discovery of natural gas on gasmaking practice, it is necessary to examine the way in which the growing shortage of suitable coking coal is being met in various countries.

(*a*) *Improved Methods of Carbonization.*

The improvement of the efficiency of coal carbonization is, of course, a desirable end in itself apart from the necessity of getting the most out of available coal; the great increases in the use of coke oven gas noticeable throughout Europe is a measure of one line of development, when a good market for metallurgical coke is available.

Turning to more conventional types of gasworks carbonization it is noticeable that the standard coke oven practice of crushing and blending the coal is being followed, notably in France where selective crushing of the petrographic constitutents is carried out in special cases.

After crushing and screening through specially designed unchokable sieves three fractions are obtained:—

Fusain—less than 1 mm. Inert.

Vitrain-clarain—0.5-2.5 mm. Fusible.

Durain—2.0-4.0 mm. Non-fusible unless very finely ground.

The durain can then be ground further and homogeneous mixtures prepared to specification. This method provides a greatly improved coke. At one installation of Woodall-Duckham continuous vertical retorts in Paris a mixture of 75% Saar coal (low swelling, 30% V.M.) with Bethune coal (high swelling, 22% V.M.) to give a mixture of swelling index 80% by the Arnu test, was obtained by mixing loads from separate parts of the coal stocking field, and passing through crushers on the way to the retort hoppers.

In those countries where little or no coke market exists, as in Japan, it is necessary to produce a hard coke and a typical Japanese coal blend is given as:—

50-60% indigenous high volatile bituminous.

15-30% low and medium volatile coking coals (Indigenous, American).

15-30% anthracites (Indigenous, French Indo-Chinese, African).

28% of the coal used by the gas industry being imported.

In the United States great emphasis is placed on proper blending of coals for coke oven use, an opinion being expressed that provided that the coal blend and temperature were carefully controlled there was no need for separate measurement and control of the gas from various batteries of ovens in one works. Admittedly the desired product was coke not gas. No retort installations are left at work in the United States.

The use of a centralized mechanical producer plant is a feature of French practice. Allowing for electrical energy it is claimed by French gas engineers that a mechanical producer shows an 80% thermal efficiency compared with 82% for a step grate producer. However, the mechanical producer gas leaves no deposit in recuperators, regenerators, or flues and is of a steady composition. The fuel consumed is graded nuts. Figures for a small works show that inclusive of labour the cost in France for mechanical producer plant is 6/7 that for equivalent step grates. The wide variation in load occuring in the Paris region, about 4:1, minimum summer day:maximum winter day, is met on this vertical installation. The relatively long periods on low throughput may have some bearing on the alleged superiority of French silica.

The desire to reduce labour costs in France has prompted the introduction of fully automatic operation or remote central control to a remarkable degree. An example of the remote control is the arrangement of a control board for all the conveyors and coal blending plant on a large coke oven installation employing coloured light signals on an illuminated diagram of the plant.

(*b*) *Coke Gasification.*

The use of coke has been mentioned in the introduction. The problem of its disposal or use as a gasmaking raw material has a considerable bearing on the final cost of gas.

As a gasmaking raw material it is predominately used in water gas and producer gas plant. These two processes were first developed for large scale metallurgical processes but their usefulness as aids and supplements to the coal gas process for producing town gas was rapidly recognized. The development of carburetting enabled the water gas plant to take on a greater part of the load.

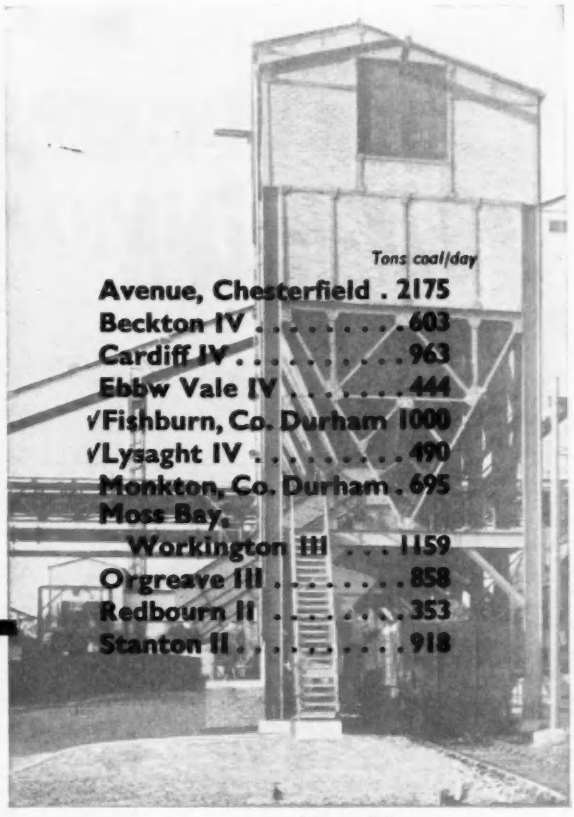
Most of the countries using coal gas do produce some water gas but it is notable that Norway, Finland, Italy and Japan do not. Norway and Papan, however, finding greater difficulty in consuming all this coke, are considering the introduction of such plant to balance their coke market.

The use of water gas in most European countries seems to be based partly on their peak load requirements and partly

W-D in 1954 were "on site" building

11 NEW COKING PLANTS

26 NEW GASMAKING PLANTS



	Tons coal/day
Avenue, Chesterfield	2175
Beckton IV	603
Cardiff IV	963
Ebbw Vale IV	444
✓Fishburn, Co. Durham	1000
✓Lysaght IV	490
Monkton, Co. Durham	695
Moss Bay, Workington III	1159
Orgreave III	858
Redbourn II	353
Stanton II	918

	Tons coal/day
Aberdeen V	175
✓Boston	96
✓Brighton III	406
Christchurch, New Zealand	150
✓Croydon IV	270
✓Derby II	380
✓Derby III	380
Dover	341
East Cowes	245
✓Edinburgh IV	259
Edinburgh V	259
Exeter	377
Gainsborough III	18
Glasgow Provan II	436
Glasgow Tradeston II	179
Grimsby VI	80
Irvine III	18
✓Jersey	190
✓Lincoln IV	138
Rotherham	617
✓Smethwick III	205
Solihull III	50
Tingley II	511
✓Tottenham V	93
Walsall II	821

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The figures following the contract names denote the number of W-D installations at this Works.

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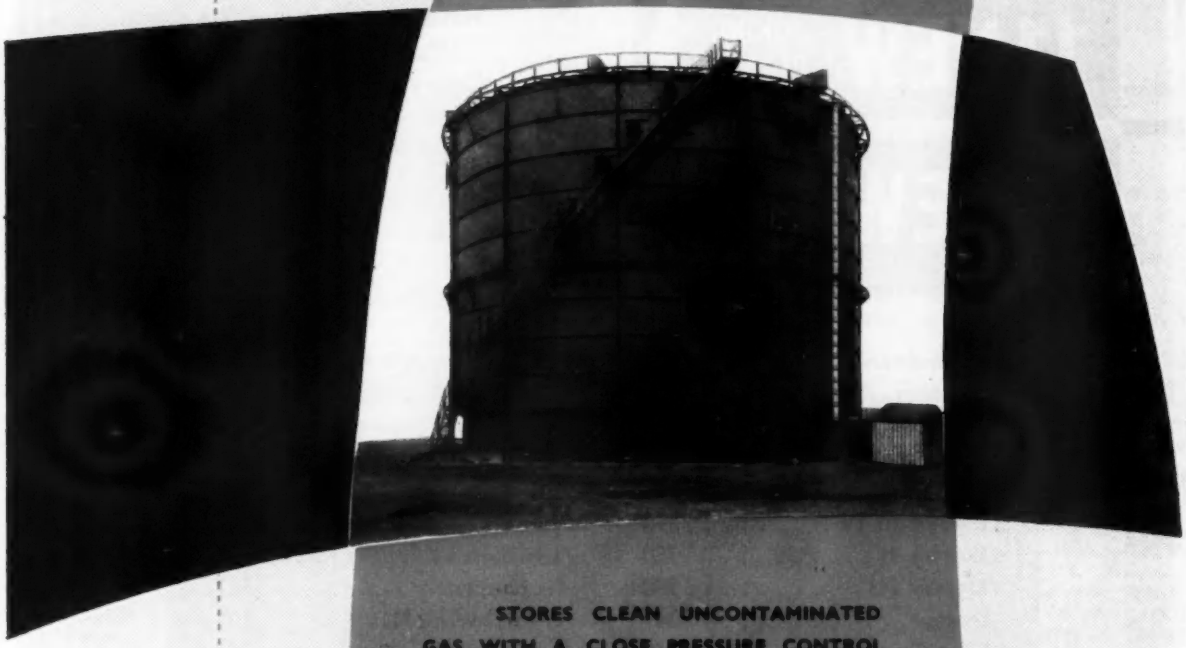

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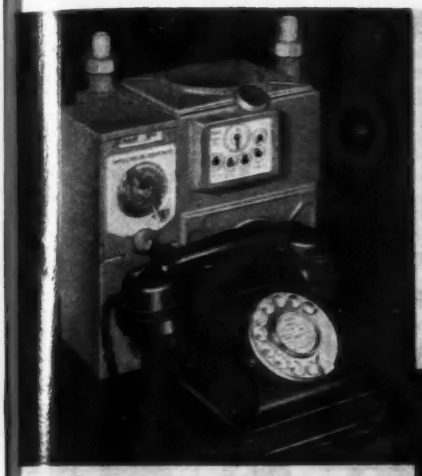

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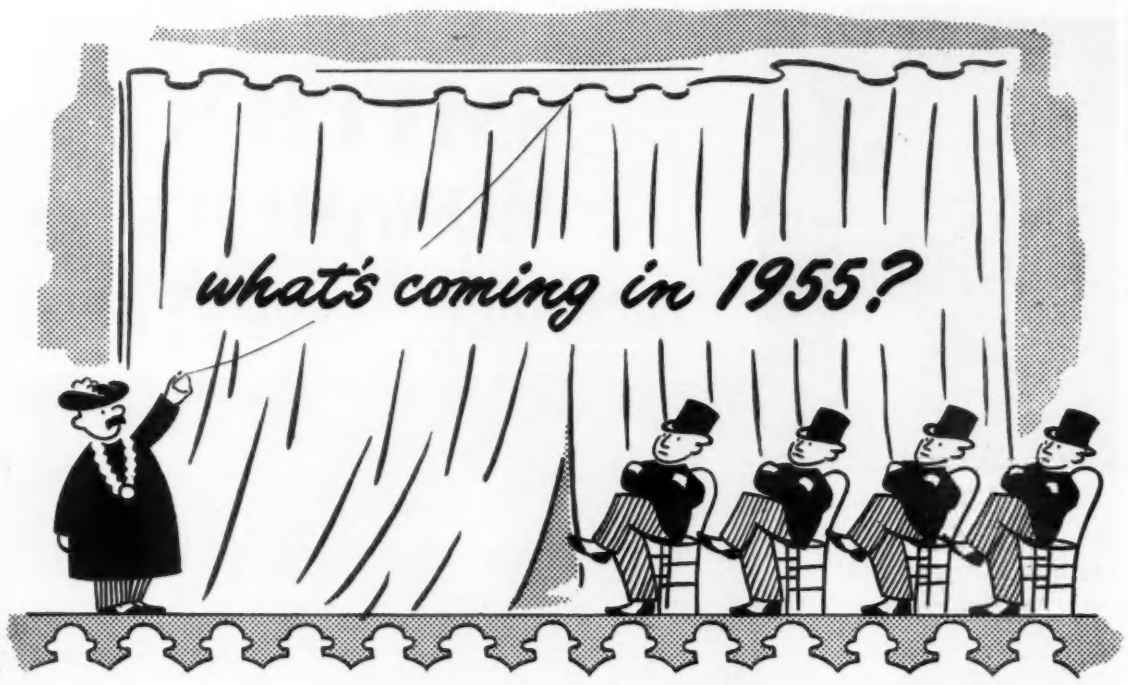

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on the coke market. A limitation on its use because of the toxicity of carbon monoxide is notable particularly in Sweden and France. In the latter case at least one full scale plant has been erected to convert carbon monoxide to carbon dioxide in order to minimize the danger. In Sweden, even under the rigours of the coal shortage during and after the war, the proportion of water gas was limited for this reason, the highest proportion of water gas to coal was for the whole country being 0.3%.

The design of water gas plant appears to be in its most advanced state in this country, with the introduction of high blast pressure. In the United States, the birthplace of the water gas process, these plants are largely disappearing or being converted to oil gas plants. Where they are retained there are not wide differences from modern British practice.

Producer gas using wood as a fuel has provided some supply, particularly in periods of shortage of coal in Spain and Switzerland, through the normal structure of the gas industry in these countries is based on coal gas with a proportion of water gas. The possibility of pressure gasification of coke has been investigated in Germany.

Oil Gas

The production of gas from oil at a suitable calorific value has been introduced in the United States as a means of meeting peak load demands on a national gas distribution system, notably by the Hall process (Fig. 2). This process is twin generator, regenerative, steam being preheated in the vessel in which carbon deposition has occurred during the previous cycle and which subsequently had been burnt off by the air blast.

Where the problem is shortage of suitable coal it is necessary to produce an oil gas interchangeable with coal gas and the solution has been found in catalytic cracking of fuel oil. The ONIA-GEGI plant developed in France from an initial research project to discover a means of preparing an ammonia synthesis gas from oil. It depends on the complete combustion of part of the oil to heat a nickel catalyst bed followed by a make period in which the oil and steam is passed through the catalyst. It may be compared with the Segas process although the latter is a regenerative process.

On the west coast of the United States where no natural gas is available and coal and coke are expensive, a medium calorific oil gas process has been developed which uses a high carbon, heavy fuel oil sprayed with steam into a previously heated refractory vessel. Large quantities of lamp black are formed, and the fact that this has a ready market in the area makes the process attractive. Combined with this rather crude oil cracking plant are oil-fired Knowles Broad ovens which produce petroleum coke from a heavy oil fraction. A high calorific value oil gas formed in this process is reformed in the cracking vessels.

Total Gasification

So long as coal gas is produced by a conventional carbonization method the usable coal is restricted to the coke forming ranks; in addition, for the coke so formed to be of use, the ash content of the coal must be kept at a low value.

The earliest type of complete gasification plant was a producer fed with coal, e.g., the Mond process making a low calorific value gas suitable for industrial use; various other processes have been introduced in this country working on this or that water gas system, but have not been developed on a large scale.

The Gaz Intégral process, developed particularly in Italy and France, employs part of the heat developed in the water gas type generator to distil off some of the volatile matter in the coal so that it may be collected separately as an enriching agent for the low calorific value gas formed in the generator. At the same time provision is made for carburetting in a similar way to a water gas set. The necessity for down steaming the fuel bed is avoided by using part of the blow gases to heat a steam preheater. Without carburetting a calorific value of 350 B.Th.U. per cu.ft. can be expected. A weakly caking coal is required to give a fuel to the water gas zone of the generator, and it would appear that graded coal is necessary; the gasification of fine coal raises other problems.

Gasification of fine, non-caking coals has been tackled by using fluidized-bed techniques. The finely pulverized coal is

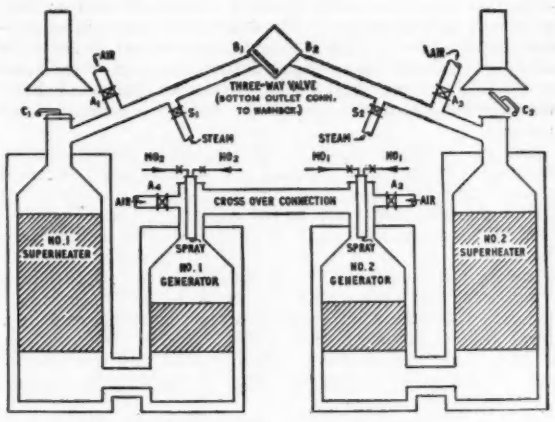

Fig. 2. Schematic diagram of Hall process.
(Report of British Gas Productivity Team.)

kept either in the fluidized state or fully suspended by reactant gases, usually oxygen and steam. Many processes have been investigated on a small scale in the United States and Germany. One may be instanced, which, although designed for the production of synthesis gas, demonstrates certain of the problems involved. The Koppers-Totzek process has been developed in the United States, but operating plants have been built in Finland and France. A poorly coking coal ground to below 200 B.S. mesh is used and the generator has identical feeding arrangements at either end so that the two reacting streams will create considerable turbulence. The coal is carried in an oxygen stream at a speed greater than the speed of ignition and the stream is enveloped by a blanket of steam superheated to 1,200°C. in a pebble heater. The purpose of the steam is to react with the carbon at a high temperature and to cool the ash to below fusion point. The generator has a refractory lining and a water-cooled case with the gas outlet on top and two ash pockets at the bottom.

Two other purely experimental techniques that are of interest are the vortex chamber and the pulsating tube. The vortex chamber, investigated in the United States and in this country, depends for operation on a balance between the centrifugal force developed by the tangential injection of coal and reactant gases and the centripetal effect of the vortex formed at the outlet of the chamber. As the coal particle becomes smaller by reaction with the gases the centrifugal force diminishes, and ideally either the ash particles are collected or they fuse and are slagged off.

In Germany the V.1 motor has been used as a basis for development of a gasification unit. The pulsating tube of the V.1 motor is fed with a coal-air mixture injected through a non-return valve into the closed top end of the tube and ignited by a spark. The explosive pressure closes the valve and the gas momentum towards the open end then reduces the pressure and more coal-air is injected. The reversal of the product-gas momentum then compresses the fresh charge sufficiently to ignite it. This cycle may be repeated between 50 and 100 times a second. The fused ash falls from the open end of the tube and a product gas with a calorific value of 110 B.Th.U. per cu.ft. can be obtained.

The most important development in total gasification depends on the use of high pressure, and associated with the high pressure the use of oxygen in place of air.

The gasification reactions are essentially:—

exothermic $C + O_2 + 4N_2 \rightarrow CO_2 + 4N_2$

endothermic $C + H_2O \rightarrow CO + H_2$

and for possible reduction of density and enrichment

$CO + H_2O \rightarrow CO_2 + H_2$

$CO + 3H_2 \rightarrow CH_4 + H_2O.$

These equations show that it is desirable to eliminate carbon dioxide and nitrogen from the gasification reactions to achieve the greatest benefit.

The removal of carbon dioxide requires compression to about 10 atmospheres and the water washing of the gas. The German Lurgi process recognizes that the compression power consumption for this process can be better applied to the

separation of the air and rejection of the nitrogen as well as carbon dioxide removal. By this means a continuous process may be substituted for a cyclic process and at the same time a gas suitable for town gas distribution may be produced at 400 B.Th.U. per cu.ft. The pressure conditions of 20-25 atmospheres are conducive to the catalytic formation of methane.

The gas produced is of a high degree of purity, and by substituting methanol at −50°C. as a washing agent (Rectisol process) for the water, oil and iron oxide processes, the carbon dioxide content can be reduced to 2% and all sulphur products virtually eliminated. Further catalytic methane enrichment to 475 B.Th.U. per cu.ft. is therefore simplified. Although the Lurgi process can gasify all sizes of coal it is not suitable for fines. High ash coals are not a source of difficulty and Australian brown coal is being employed in a Lurgi plant. The whole process is carried out at high pressure with a consequent higher capital cost and power cost, but the power cost can be offset by utilizing the pressure for distribution purposes.

Further developments with a view to hydrogenation of coal to increase the calorific value of the final gas are being made in this country. A French development, as yet on a small scale, to apply the Lurgi principle to fines (100 B.S. lignite) is the Bianchi process (Fig. 3).

Oxygen, steam and coal are injected tangentially into the lower part of the generator at 20 atmospheres pressure, the

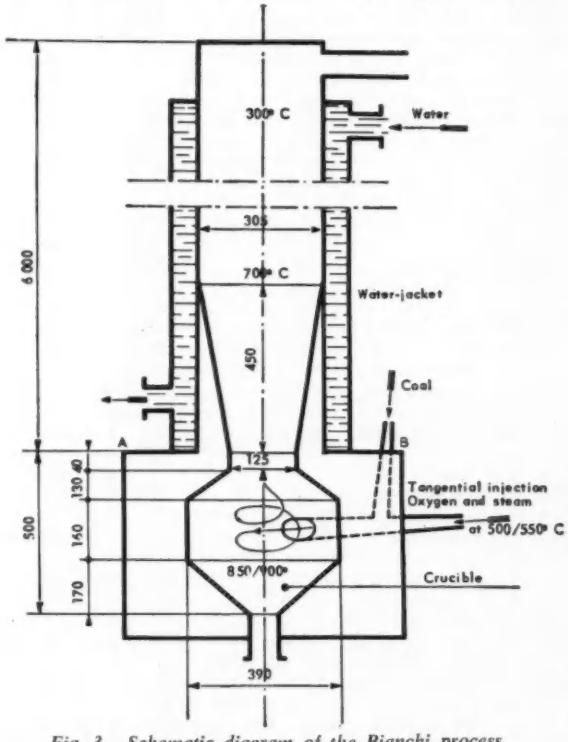

Fig. 3. Schematic diagram of the Bianchi process.
(Reproduced by courtesy of O.E.E.C.)

gasification reactions taking place at 900°C. and the ash falling to a bottom pocket. Some fine ash and unreacted carbon rises in the gas to the upper water-cooled zone of the generator. Part of the carbon monoxide is converted to carbon dioxide with the production of hydrogen, and the fine suspension of carbon and ash act as a catalyst for methane synthesis at 500°C.

Gas of a calorific value of 400 B.Th.U. per cu.ft. has been made and a larger unit may produce greater developments in these investigations.

Other Gasworks Processes

Other plant encountered on a gasworks, while differing in detail, still carries out similar functions in similar ways. Though mention must be made of liquid methods for the removal of hydrogen sulphide which are also being developed in this country, hydrogen sulphide is not dealt with quite so rigorously in other countries as it is here except in North America, France, and Commonwealth areas.

In holder design the main developments of wet holders have taken place in this country but spirally-guided holders are beginning to lose their unique interest on the Continent. It should be noted, however, that those countries subjected to more severe winter temperatures do not find the spirally guided holders superior to the column guided type. In Germany the dry holder seems to have caused less trouble than was expected during the war when they were kept at work. In France some interesting small holders are still at work in which the inlet and outlet mains form articulated arms attached to the crown of the holder. As a natural development from using great natural gas fields as new storage in the United States, methods of utilizing suitable geological formations as underground storage are being investigated and used.

Although underground gasification is still the subject of investigation in Belgium, French Morocco, Italy, the United States and this country it seems fitting to take notice of it as a possible future large-scale method of dealing with low rank coals and lignite in unworkable seams. It has been reported from Russia that large-scale working has been successful employing the stream method. Four methods have been employed so far:—

(*a*) Mining operations to prepare two parallel galleries with a connecting fire-face gallery which moves back behind the parallel galleries as gasification proceeds stream-method.

(*b*) Parallel boreholes into the seam link the reaction zones.

(*c*) Use of natural or artificial cracks in the seam. The artificial cracks being produced by high pressure injection of air or liquid or electro-carbonization. Electro-carbonization deserves special mention as it provides a gas of much higher calorific value than gasification and has also been applied to the production of gas from an as-yet unused source of supply, namely, oil shale.

(*d*) Coal mined by conventional processes is stacked in the chambers so formed and then the underground chamber is used as the generator of a normal producer.

Various reacting gas mixtures have been employed and steam-oxygen appears to offer the best quality gas, as shown by experiments in Belgium.

DISCUSSION

Mr. L. J. Clark (North Thames Gas Board) said one's first impression of the survey was what a tremendous development had taken place in relatively recent years in the natural gas field. It was very difficult to realize what changes had occurred in America alone. The use of natural gas had more than doubled itself in the past seven or eight years, and at the present time, in America, some 97% of the requirements of the country was met by natural gas. The manufacture of gas had practically disappeared there. Another feature was the higher usage; in America about 40 times as many therms of gas were used as in this country. Even allowing for the higher population it was still something like 12 to 14 times per head of population compared with what it was here. Much of this, he admitted, was for industrial purposes.

On the possible use of natural gas in this country, Mr. Clark said that as far as indigenous sources were concerned, he was not too hopeful. The matter was dealt with by Mr. Peter Cox, a geologist with the D'Arcy Exploration Company, who had said that, from his observations of our geological structure, we might expect to find natural gas in this country in the order of tens of millions of cu.ft. per day, which was not very great compared with, say, Italy or the United States. But with regard to the possibility of shipping the stuff here, in liquid form, at this stage it looked very promising. There were some great technical problems to be overcome but he thought it was possible. The great point of this development was that it might be possible to use natural gas supplies which were at present going to waste in very large quantities.

Mr. P. J. Savage (North Thames Gas Board), on the subject of oxygen, said it seemed to him from the processes Mr. Grant had described, that this was going to become a very important raw material to the gas industry. What were the

thoughts of engineers abroad on the method of producing this material? Did the normal cooling method reign supreme or was there any chance of electrolysis of water taking its place? Mr. Savage asked if the author could tell him something about electro-carbonization.

Mr. Grant, replying, said the use of electrolysis obviously held out promising prospects, particularly the possible advantage of gaining hydrogen, but he had not come across any large scale attempts to use the process. On electro-carbonization, Mr. Grant said some experimental work had been done in a retort heated by a heavy electric current; this was a similar idea to an electrically heated steel-making furnace. In underground gasification it had been used to provide carbonization in a seam, but it involved preliminary boring operations.

Dr. S. Pexton (Senior Fuel Chemist, North Thames Gas Board), said he would like to say something about water gas production, because that was the method whereby they had met the expanding load in this country. The highest efficiency of water gas production that he knew of related to blue water gas production in a small generator which was built for the Fuel Research Station in 1919-20 and that did not involve any oxygen. This was a perfectly normal method of producing blue water gas from air and the efficiency of gas production was over 70%. He thought it was well to recognize why such a high efficiency could be obtained in what was a very small plant. It was only of ½ mill. cu.ft. per day. It was provided for heating the retort settings at the Station, and the reason for its being so efficient was that it employed a very short blow-time—half a minute.

In an intermittent process of the water gas type, the ash bed and the fuel acted as the regenerators. Adding to that point, Dr. Pexton said it was rather like speaking of the coke as a pebble-cooler. In the latest and largest water gas plants, they had achieved not only very high outputs indeed, but they had also succeeded in getting perhaps not quite as high an efficiency as the Fuel Research Board obtained in 1920.

Mr. J. B. McKean (South Eastern Gas Board), said the reason why the question of alternative processes was being raised probably lay in the fact that production of gas from coal today was getting very costly ineded and it was only because of that that they were getting some of the other methods, such as the Lurgi process.

Mr. A. J. S. Wiseman (North Thames Gas Board), remarked it had been made clear that the use of natural gas in America must have made gas very much cheaper and therefore there had been an enormous increase in usage per consumer. He believed this was taking place in other places where natural gas was coming to the fore. On the other hand, in those places where alternatives have been used because of the shortage of coal, one got the impression that gas was going to be more expensive. In those countries there would appear to be a time when they would have to go back to ordinary methods. This reverse process would be a very painful one, believed Mr. Wiseman.

Mr. Grant, said the changeover in countries looking for other methods, as had been said, involved application of plant. It also involved reduction in labour, and labour charges versus capital cost was a point to be borne in mind.

Dr. A. E. Haffner (Station Engineer, Fulham), proposed a vote of thanks to Mr. Grant.

Industrial Management

During the Michaelmas term of 1953 the United Steel Companies, Ltd., provided a panel of speakers for the Faculty Board of Engineering at Cambridge University. The subject was 'Industrial Management' and lectures on various aspects were given over a period of seven weeks by senior members of the Company. Now, the lectures have been reprinted in a book called 'Industrial Management.'

The first lecture was delivered by the Managing Director, Mr. G. Steel, and described the rôle of the directing authority in a large company. His own Company, he said, in the ten years 1945-55 will have spent between £50 and £60 mill. on capital account, 'and it is obviously essential to ensure as far as possible that every penny of such a huge sum is devoted to proper purposes; that it is spent on essentials and not on frills; that it is spent with due regard to economy and that it is expenditure which is productive either in the form of increased output or more efficient operation or improved quality.'

Mr. Steel stepped into the field of controversy by saying that 'for a man who is ambitious for the highest administrative positions it would be a mistake to specialize for too long a time.'

Dr. J. H. Chesters, Assistant Director of Research, said, on the organization and application of scientific research in industry, that the ability to work in a team has 'long been recognized as equally vital, the isolated research worker "voyaging through strange seas of thought alone"—being now something of a curiosity.' He also asserted that the man who was mentally fresh would provide more new ideas in an hour than he would do in a week when intellectually stale.

There was plenty of humour in some of Dr. Chesters' remarks. He said: 'The tendency to hold all the results until the story can be written in full may be partly due to the wholly fallacious idea that a magnum opus of, say, 100 pages, admirably illustrated by photographs and drawings, will create an excellent impression on the recipient.'

However, probably the most biting remarks were made by Mr. K. Paterson, Director and Chief Mechanical and Civil Engineer, Appleby-Frodingham Steel Company, who said about planned development that nobody could manage a big construction project from an office. No matter how good the information, or how many marks were made on progress charts, the leadership must be strictly practical. 'You can't be a dynamic and practical leader unless you are in close touch with the job physically.'

Other lectures were on: 'Production management in an integrated iron and steel works'; 'Administrative controls in management'; 'The duties and problems of the chief engineer in a large works manufacturing special steels'; and an especially interesting one on 'Staffing a steel works: Problems in training—from the apprentice to the manager.'

The book is published by the United Steel Companies, Ltd., at Sheffield.

ASBESTOS CEMENT PIPES

The two British Standards for asbestos cement flue pipes and fittings—heavy quality (B.S. 835:1954), and light (B.S. 567:1954) have been revised to bring them into line with present-day practice. The only alteration found necessary in each case was the addition of hydraulic tests for fittings. Recent research has led to the development of methods by which the hydraulic testing of fittings has been considerably simplified, and therefore a requirement has been added that fittings shall be tested as well as pipes. Two methods of testing are given. The first is by means of simple grooved discs secured to the fitting, and the alternative test is by means of a jig in which a series of adjustable sealing caps can be arranged to suit the type and size of fitting to be tested. Copies of these British Standards can be obtained from the British Standards Institution, 2, Park Street, London, W.1. (price 5s. each).

Mr. R. J. Gregg

Recently a presentation was made to Mr. R. J. Gregg, Publicity Manager of the Gas Council, to mark his 50th birthday. The presentation, which was the gift of friends and colleagues at Gas Industry House, took the form of a portrait and was handed over by Mrs. Eileen Murphy, Home Service Officer to the Gas Council.

Underground Pipeline Corrosion and Cathodic Protection*

By JOHN F. DAY, B.Sc., ASSOC.M.INST.GAS E. †

DESPITE the fact that it has been estimated that the cost of replacing corroded buried pipes amounts to £5 mill. annually in this country and that protective coatings alone are not 100% effective in preventing corrosion, the adoption of cathodic protection on a widespread scale has been slow, and we have lagged behind the United States and some European countries in appreciating the economic advantages of the method. Now that its effectiveness has been amply illustrated it is hoped that the leeway will be rapidly made up. The mechanism of cathodic protection, and of course corrosion, is relatively simple to understand, but the successful practical application of the method is more difficult, for many incalculable variables, such as bare metal areas, soil or water resistance, various contact resistances have to be taken into account, mainly by patient and accurate observations on a trial-and-error basis. Design becomes less tedious as one is aided by experience, but the design of a system from the drawing board apparently will never be possible.

To apply cathodic protection to a new uncoated pipeline would be a hopelessly uneconomic method of preventing corrosion; minimum expenditure occurs when a reasonable coating is applied and inevitable 'holidays' are sealed electrically from corrosion by cathodic protection.

Basic Corrosion Theory

Corrosion is an electrochemical phenomenon in that it involves metals, chemicals, and the flow of electric current, which together form electrolytic cells. All such cells have four basic components:—

(*a*) The 'electrolyte'—composed of water and dissolved chemicals. It is homogeneous in a true aqueous solution, but in most soils it may vary locally as to concentration or to the kind of dissolved chemical. An electrolyte will conduct electric current.

(*b*) The 'anode'—a metal or substance in contact with the electrolyte. With few exceptions, the surface of the anode is oxidized, or corroded, by combination with the chemical in the electrolyte. The term oxidation essentially means the action whereby an atom loses electron(s) and becomes a positively charged ion.

(*c*) The 'cathode'—a metal or substance contacting the electrolyte. Its surface is not reduced by, but receives protection against, corrosion.

(*d*) The 'conductor'—externally connects the anode and the cathode to complete a circuit for current flow.

The general term for either anode or cathode is 'electrode' and electrochemical cells fall into three general groups:—

(1) 'Electrolytic cells'—contain the above-listed four components plus an external source of electrical energy connected to the conductor between anode and cathode *to cause* current flow. This is the type of cell used for electrolytic refining of metals. (It is the cause of stray current corrosion of pipelines and is established in a different form from pipelines cathodically protected and using a source of externally-generated direct current).

(2) 'Galvanic cells'—have the four basic components, but with dissimilar metallic electrodes in a homogeneous electrolyte. The common dry battery is typical. The metallic anode reverts to a more stable form by combining with chemicals from the electrolyte, thus liberating energy stored in the metal, which energy is manifested as electric current flow through the electrolyte from anode to cathode. Current returns through the conductor from cathode to anode. The conductor connection to the anode is negative in polarity; that to the cathode is positive.

Two different metals in the same electrolyte always produce a fixed potential (electric pressure) between them. The current flow through a coupled circuit will be in direct proportion to the potential between the two metals and inversely proportional to the resistance of the circuit, which will comprise the resistance through the conductor, the resistance through the electrolyte and may often include counter potentials which develop at the electrode surfaces to produce effects equivalent to resistance. The potential relation between metals is called the 'electromotive series,' and with gold as zero the potential which would exist between gold and these baser metals in an electrolytic solution of a salt of the metals are as shown in Table I.

TABLE I

Metal	Potential to Gold (volts)
Gold	0.00
Lead	0.56
Copper	1.02
Iron	1.80
Zinc	2.12
Aluminium	3.06
Magnesium	3.76

Any metal below another in the table will oxidize, *i.e.*, corrode, when connected to the one above and immersed in an electrolyte, such that a potential difference exists between them. For example, zinc will corrode if connected to iron and then placed in an electrolyte, the fixed potential difference between them being (2.12 − 1.80) = 0.32 volts.

This type of cell is established when zinc or magnesium is used to protect iron pipes cathodically against corrosion and when an external source of electrical power is not employed.

(3) 'Concentration' cells are similar to galvanic cells except that they have anode and cathode of the same metal in a non-homogeneous electrolyte. Differences of either chemical concentration or type of chemical in the electrolyte causes current flow. In the former case the anode is usually established in the concentrated portion of the electrolyte. In the latter the anode will be established in the type of chemical that combines most readily with the electrode material.

In all electrochemical cells the amount of metal removed from a corroding anode has a fixed relation to the current flow, *e.g.*, one ampère flowing for one year from a steel pipeline will remove some 20 lb. of iron.

When current flows in an electrochemical cell hydrogen is deposited on the surface of *the cathode* and this deposit builds up a resistance to the flow of current. When the surface is completely covered with a film of hydrogen the current flow is substantially reduced since the hydrogen has an extremely high electrical resistance. The cell is then said to be 'polarized.' If the current flow is stopped by breaking the conductor the film disappears gradually at a rate controlled by a reaction in the electrolyte which tends to remove or combine with this gas deposit. When removal is complete the cell is said to be 'depolarized.' Polarization of the cathode limits the rate of anode reduction.

Corrosion of Underground Pipelines

Iron (or iron alloys), the material of most pipelines, will combine with many chemicals found naturally in soil to form

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oxides, hydroxides, carbonates, sulphates, sulphides and chlorides (the last four compounds will change to oxides upon prolonged exposure to air and moisture). This is because pipes laid underground are of necessity placed in soils having sufficient moisture to form electrolytes and so to allow current flow. Thus electrochemical cells are inevitably set up by such agencies as:—

(*a*) Differences in moisture content of adjacent soils giving rise to concentration cells. (Fig. 1.)

(*b*) Differences in soil composition giving rise to concentration cells. (Fig. 2.)

(*c*) Very slight differences in metal composition resulting in galvanic cells, e.g., this may occur if steel pipes are

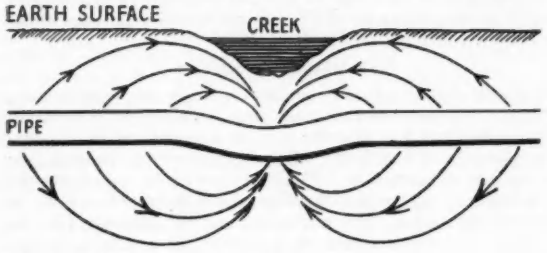

Fig. 1. Differences in moisture content of soils producing concentration cells.

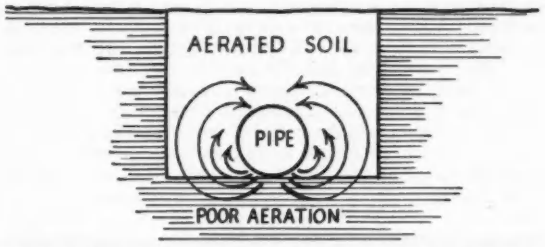

Fig. 2. Differences in soil composition producing concentration cells.

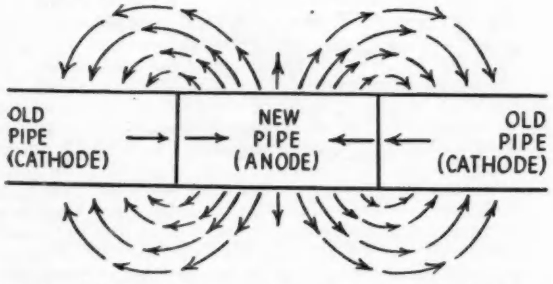

Fig. 3. Differences in metal composition resulting in galvanic cells.

connected to spun iron pipes or even if new pipe is connected to old pipe. (Fig 3.)

(*d*) Differing metals in contact forming a galvanic cell. (Fig. 4.)

(*e*) By iron oxide acting cathodically towards iron to form a cell. (Fig. 5.)

(*f*) By stray current to form an electrolytic cell.

To stipulate exactly the type of electrochemical cell in any particular case of pipeline corrosion may be exceedingly difficult. If stray currents are known to exist then it is clear that the formation of an electrolytic cell is likely, or if a brass valve is inserted in a steel line corrosion can be explained by galvanic cell formation, but one obvious reason for cell formation does not preclude the possibility that another form of cell may also be causing corrosion.

Thus anodic and cathodic areas on pipelines may be fractions of an inch or miles apart, but the circuit of type shown in Fig. 6 is always established.

Cathodic areas generally exceed anodic areas in extent along pipelines. This is due to polarization which occurs as the current flows from the anodic area to deposit hydrogen

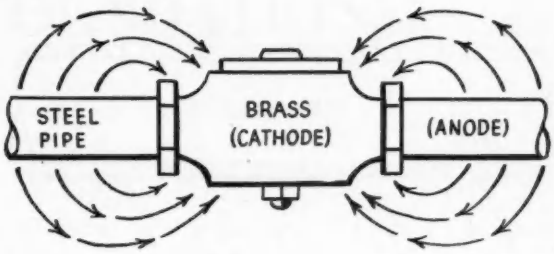

Fig. 4. Differing metals in contact forming galvanic cell.

on the adjacent cathode surfaces. The complete polarization of one area diverts current flow to more distant adjoining surfaces, thus the polarized cathode surface is extended until equilibrium is established between the forces causing depolarization, resistance to current flow, and potential developed at the anode. Cathodic areas maintained under partial or complete polarization account for the well preserved pipe surface usually found around a large pit-hole or adjacent to a severely corroded section of pipeline, and accounts also for the relatively large amount of good pipe generally found in lines that have suffered numerous leaks. (Fig. 7.)

The rate of corrosion of an underground pipeline largely depends upon the ease with which current can flow, i.e., the circuit resistance of the established cell, which in turn is proportional to:—

(1) The amount of moisture present in the surrounding soil.

(2) the amount of dissolved chemical present in the soil to produce ions to convey current.

Thus when assessing the likelihood of rapid corrosion of a pipeline if placed in a particular soil. the measurement of the electrical conductivity of the soil will give the most valuable information. In practice, soil resistivity is measured (resistivity merely being the inverse of conductivity), the resistivity of a soil being universally taken to be the electrical resistance of one centimetre cube of that soil. Soils have been classified as shown in Table II.

TABLE II

Resistivity	Corrosion expected
0-900 ohm-cms ..	Very severe
901-2,300 ohm-cms ..	Severe
2,301-5,000 ohm-cms ..	Moderate
5,001-10,000 ohm-cms ..	Mild
> 10,000 ohm-cms ..	Very mild

Prevention of Corrosion

In order to prevent corrosion of a pipeline it is necessary to eliminate the electrochemical cells causing the flow of current into the earth from anodic areas. This can be achieved by applying a potential to these areas such as to make the whole pipeline cathodic, i.e., such that current is flowing from the earth to the pipeline at all points throughout its length. Of course, it is necessary on economic grounds that a minimum amount of current to ensure complete protection of the pipeline should be employed. With this in view, the pipeline to be protected is first given a good quality protective coating. However, this in itself is insufficient since minute faults in the coating, i.e., 'holidays,' and unavoidable rough handling of the coating while the pipe is being laid,

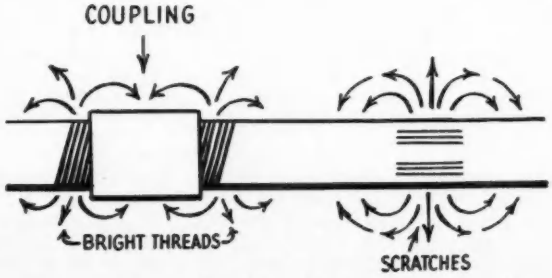

Fig. 5. Iron oxide acting cathodically to form cell.

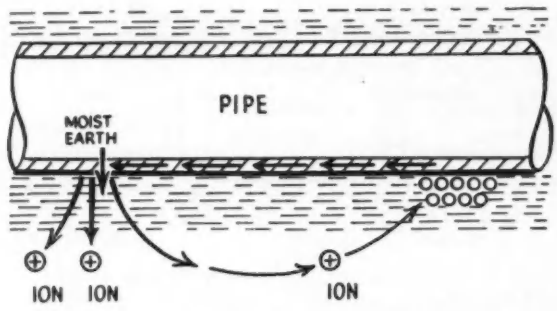

Fig. 6. Type of electrolytic circuit formed in pipeline.

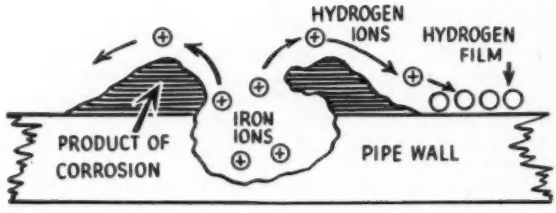

Fig. 7. Pitting of a pipe and build-up of corrosion products.

inevitably result in bare metal areas which would corrode if no further protection was applied.

Cathodic protection may be applied to a pipeline by means of either of two general methods; (*a*) The 'sacrificial anode' system; (*b*) The 'impressed current' system.

(*a*) *The Sacrificial Anode System.*

This method involves the installation of 'galvanic anodes' (e.g., zinc or magnesium), that are higher in the 'electromotive series' than the pipe metal.

When these are connected by an insulated conductor to the pipeline, true galvanic cells are created that cause the flow of current through the soil from the anode to the pipeline without external power supply. These are effective until the anode metal is consumed, after which it must be replaced. This is the reason for the method being known as the 'sacrificial anode' system. Pending this need for replacement, such installations require little or no attention. Anodes are made to last for some ten years. However, this method is limited in its use by the fact that the potentials established are low and therefore the current output is also low. Because of this it is desirable to locate the galvanic anode quite close to the pipeline to be protected, and only relatively small areas of bare metal can be satisfactorily protected. Steps are usually taken to maintain all circuit resistance at a minimum, especially the anode-to-soil contact resistance, by provision of a backfill, so that maximum current is obtained from the available potential.

Zinc has been used for galvanic anodes because local action of soil on the metal surface is slow; however, the potential of zinc with respect to iron is low—0.32 volts. The addition of a backfill around zinc anodes is essential and provision should preferably be made for entrapment of surface water.

Magnesium anodes are more extensively used nowadays, but the technique of proper installation is still being developed. When installed as shown in Fig. 8, the useful current output of magnesium is lower than theory would suggest because of local cell action. Even so a potential of approximately 1.1 volts is obtainable as against a theoretical value of 1.96 volts which makes magnesium more attractive as a sacrificial anode than zinc. The backfill usually used with magnesium anodes consists of 'Aquagel' (lentanite) to retain moisture, and sodium sulphate and calcium sulphate to lower contact resistance.

(*b*) *The Impressed Current System of Protection.*

This method employs current obtained from a D.C. power source (normally a transformer-rectifier working off A.C. mains) and used in conjunction with metallic or graphite anodes in circuit. Sufficient current must be employed to ensure that the pipe is sufficiently cathodic with respect to the electrolyte (soil) so as to prevent metal ions leaving the pipe surface. The quantity of current necessary to obtain this condition will depend upon the area of exposed pipe metal and the condition of the soil. The current flow necessary may be anything from 1 to 15 milli-amps per sq. ft. of bare metal, but is generally some 3 to 6 milli-amps per sq. ft.

The anodes are normally of junk cast-iron or graphite, and should contain sufficient material to ensure a service life of 20 years. Loss from a cast iron anode is much more rapid than from graphite, and cast iron is suitable only because surface iron is removed rapidly leaving behind carbon which brings about an immediate reduction in the rate of corrosion of the anode. Generally the impressed-current system is the sounder method of protecting buried pipelines since appreciable lengths of pipe may be afforded complete protection with anodes at long distances apart, whereas sacrificial anodes would be required in great numbers.

Soil Resistivity Surveys

In order that cathodic protection may be efficient and effective it is necessary to plan from a series of preliminary test results and determine the current necessary to ensure that the pipeline is sufficiently electro-negative to prevent the occurrence of corrosion. The first step is to determine the corrosiveness of the soil through which the pipeline is to be laid by measuring soil resistivity, and by checking for the presence of sulphate-reducing bacteria. The latter give rise to an aspect of underground corrosion that has not been discussed so far; it comes under a more specific heading of 'biochemical' corrosion. Sulphate-reducing bacteria are the only type of bacteria known at present which cause extensive corrosion in soil and water. The exact nature of the chemical reactions which occur are not definitely known, but in general terms these bacteria in their life process cause the liberation of hydrogen sulphide which combines readily with iron. Now it has been previously mentioned that during corrosion hydrogen is released at the cathode areas and when it covers a surface, that surface is said to be polarized; further, the film reduces current flow and thus the rate of corrosion by raising

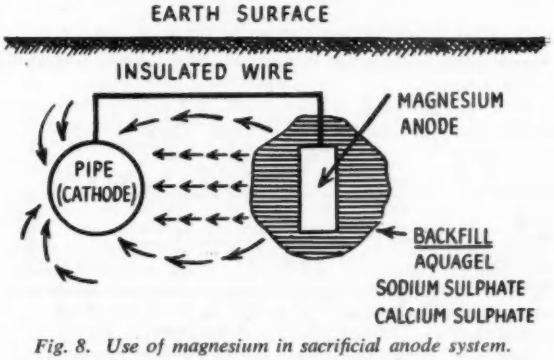

Fig. 8. Use of magnesium in sacrificial anode system.

the electrical resistance in the established cell. Sulphate-reducing bacteria have the ability to remove the hydrogen film and thus their damaging effect is two-fold. They are invariably found in neutral waterlogged clays in this country.

A soil resistivity survey gives an indication of the type of cathodic protection suitable for a proposed pipeline, it may indicate that cathodic protection is not really necessary at all; it may also suggest that, if possible, a pipeline route diversion should be made to avoid particularly corrosive ground.

An actual cathodic protection system can only be satisfactorily designed after a pipeline has been laid. To do this the electrical potential between the metal pipe and the soil at various locations throughout its length has to be determined. In measuring this, use is made of a copper/copper sulphate half cell as an electrode. Contact is made with the pipe from the negative terminal of a potentiometer or a high internal resistance voltmeter, while the positive terminal is connected to the half cell placed in contact with ground as near to the pipe as is possible. It is sufficient to take pipe to soil potentials at the extremities of a pipeline and at regular intermediate positions approximately quarter of a mile apart. The pipe to soil potential may vary as much as 0.4 volts between major anodic and cathodic areas of a pipeline. General experience has shown

(*Continued on page 176*)

LAYING THE FOUNDATIONS*

by E. W. Stevenson, Assoc.M.Inst.Gas E., A.M.Inst.F.†

I REGARD education and training as foundations—the foundations upon which our civilization is built and through which we have reached our present day state of advanced progress. The 20th century has produced very considerable improvements in the educational facilities available to young people of school age, but during the past few years there has been a definite trend towards 'further education' for those who have left school, and a scheme of compulsory training has now been introduced into industry which should have far reaching effects upon the economic and industrial future of our country. It is this scheme of further education as it affects the gas industry that I should like to elaborate, so that you may have a clear picture of why we are adopting the scheme, how we are hoping to put it over and the results which we expect to achieve in the North Western area.

Training in the gas industry has not been overlooked in the past. Local gas companies closely collaborated with the education authorities in their particular area in order to promote training among their employees; but their efforts were limited by local conditions and the absence of any recognized policy for putting into motion a scheme of organized training for the gas industry as a whole. With the assimilation of local gas companies into one unit and the formation of that unit into area boards after nationalisation, the mechanism was provided for an extensive training campaign within the industry, and by Section 4 of the Gas Act, 1948, it became the statutory responsibility of each Board to provide adequate training facilities for their employees. Education and training had thus become recognized as a fundamental part of the industry's structure, and a basis had been provided for the highest degree of efficiency which could be attained within the industry.

Although training is an obligation under the Gas Act, the extent to which an area board may implement this responsibility is dependent upon its members, for they formulate the policy to produce a sound economic structure which will provide efficient service to the public. In the North West we are particularly fortunate in having a Chairman and members of the Board who realise the vital necessity for having highly-skilled personnel to control and administer their plant in order to produce the efficiency which will enable their products to be sold at an economic price competitive with other industrial fuels. This realization has prompted the Board to implement for the present and future personnel a comprehensive scheme of training and education, conjoined with generous facilities for day-time release and the payment of course and examination fees which will enable employees to obtain the necessary qualifications to fit them for the higher posts of the industry. The facilities which the North Western Gas Board offers to its employees are:

Day-release

(a) It is compulsory for all gas-fitting apprentices to attend a training centre once a week for gas-fitting practice and theory.

(b) All other apprentices will be granted a day's release for attendance at a local technical college to take an appropriate course.

(c) Student apprentices and present junior technical staff will also be granted a day's release for attendance at a technical college to take an approved course.

(d) All other employees up to 18 years of age will be allowed a day's release to take an approved course.

(e) Other employees, including junior clerical workers over 18 years of age, can be permitted to attend approved classes during the day-time, at the discretion of the group general manager.

Financial Assistance

The Board are prepared to refund tuition fees to all employees who enter upon and maintain satisfactory progress in courses of study (including correspondence course) approved by the group general manager and Training and Education Officer.

In carrying out our training programme in the North Western Area, nothing short of the best will suffice so far as skill and efficiency are concerned. The best material, the best methods and the best service, are what we hope to achieve, so that the first and vital element in 'laying the foundations' is the material we use in the initial stages. No training scheme, however soundly planned or administered, can or will produce the desired results unless the personnel participating have the necessary ability or desire to acquire the academic and practical knowledge which the industry demands. With this aim in view, a carefully planned system of recruitment is being effected which should ensure the acquisition of the right type of personnel into the industry.

In the past, gas fitters and technical personnel were usually recruited by individual undertakings, and while in some instances results have justified the choices made, in many other cases they have left much to be desired. With the implementation of the National Classification Scheme for Gas Fitters in September, 1953, about which I shall be going into more detail later, it became essential to recruit youths who would not only make good craftsmen but who would also possess a reasonably good general education. Thus prospective apprentice gas fitters are now given a series of educational tests consisting of arithmetic, English, spelling and general knowledge, in addition to a mental ability test which enables their mental ability age to be assessed. Each applicant is then interviewed by the Training and Education Officer, together with the district service manager in whose area it is intended he should be employed. Each year a constant number of apprentice gas fitters will be recruited, thereby ensuring a steady flow of trained gas fitters in the future, and enabling the Board to maintain a highly efficient system of fitting and maintenance so desirable to consumers.

Technical personnel were formerly recruited as student chemists, student draughtsmen, student gas engineers, etc., and on being allocated to a particular undertaking were given, in some instances, a reasonably good practical training, but in many other cases, no planned system of practical training was pursued. Consequently, many promising students have been seriously handicapped by their restricted practical experience. Today, all technical personnel are recruited as student apprentices, irrespective of whether they will ultimately be attached to the production, distribution, sales and service, industrial or transport side of the industry. As with gas fitters, an educational test must successfully be undertaken in addition to a certain standard of general education being attained. The applicant must possess the General Certificate of Education with passes at Ordinary Level in mathematics, English language and a science subject. He is then interviewed by a panel consisting of the general manager of the group or his representative, the Board's Training and Education Officer, a representative of the technical and planning department and the group training and education officer. Now that the standard procedure has thus been laid down, a basis exists for a comparison of the qualities and potentialities of the various applicants, and in consequence, only the best 'foundations' are chosen. A six months' probationary period is served by both types of apprentice doubly to ensure the right selection.

With regard to the training of apprentice gas fitters, the National Classification Scheme requires a gas fitter to pass the

* Abstracted from a paper read to the Manchester District Junior Association of Gas Engineers on December 15, 1954.

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Intermediate Examination of the Joint Advisory Committee in Gas Fitting before being given the status of second-class gas fitter and the Final Examination of the City and Guilds of London Institute, before acquiring the status of first-class gas fitter. This has necessitated a variation in policy and teaching methods, as both the Intermediate and Final Practical Examinations are now conducted in cubicles constructed in accordance with the recommendations of the City and Guilds Advisory Committee for Gas Fitting. The Board fully recognize the desirability of having trained and qualified gas fitters, and in order to meet the requirements of the new scheme, have instituted eight training centres at Manchester, Stockport, Hollinwood, Bolton, Burnley, Preston, Liverpool, and St. Helens. At each of these centres, cubicles have been constructed to be used for instructional purposes, and at the appropriate time, for examinations. Qualified personnel, consisting of a chief instructor, an instructor, and an assistant instructor, are based at each of these centres where the latest methods of teaching are being employed. An apprentice gas fitter at the onset of his career enters one of the Board's training centres for full-time instruction for a period of approximately seven months, during which time he will be given instruction in the theory of gas fitting for five hours a week, and practical instruction for 15 hours per week, together with additional lectures on subjects such as safety and first aid. In addition, he will attend the local technical college during normal working hours to study the appropriate ancillary subjects, geometry and calculations, engineering drawing, English and science. This instruction should enable the apprentice to pass the first year gas fitting course of the Union of Lancashire and Cheshire Institutes. In the meantime, the six months' probationary period will have been completed, and if it is considered that an apprentice will 'make the grade,' indentures will be signed covering a period of five years dating from the time of commencement at the training centre. On the other hand, should it be felt that an apprentice is unsuitable, then steps will be taken to tell him to seek further employment. This practice, which may on the surface appear ruthless, is very necessary and equitable from both the Board's and the apprentice's point of view. The standard required of gas fitters of the future is higher than ever before. There is no longer any easy way to first-class fitter status except by examination in the theory and practice of gas fitting, which must be passed as a whole and not in part, and if it is apparent that an apprentice is unable to 'make the grade,' it is better for him to transfer to some other type of employment than to embark upon an apprenticeship unsuited to his capabilities.

District Experience

At the conclusion of the initial training period, the apprentice is allocated to a certain district to acquire district experience for the remaining five months of his first year's employment. In the following September he will again attend the training centre for one day per week to receive further instruction in the theory and practice of gas fitting, in addition to attending at the local technical college to study the appropriate second year ancillary subjects. The Intermediate Examination in Theory and Practice of Gas Fitting is taken at this stage. This course of instruction is continued during the third and fourth years, at the end of which time the Final Examination is taken. If an apprentice is fifteen years of age when he enters the training centre, when he is nineteen years of age it is possible for him to have obtained his Final Certificate in Gas Fitting and by reason of the appropriate ancillary subjects, the Full Technological Certificate of the City and Guilds of London Institute in Gas Fitting. The remaining period before the expiration of his apprenticeship can very profitably be employed, if the apprentice possesses the necessary ability and propensity, by continuing with his studies for the Technology of Gas Supply Certificate of the City and Guilds of London Institute. The possession of this certificate will take him part of the way along the pathway of promotion to supervisory positions and posts in the field of salesmanship. In accordance with Government requirements, it is necessary for national service to be performed at the end of an apprenticeship unless deferments are obtained to meet special circumstances.

Student apprentices, after successfully completing six months' probationary period, are trained in an entirely different manner. They enter into an apprenticeship agreement of five years' duration, but during the first two years of their training they are given a comprehensive, though brief experience in all branches of the industry. For those student apprentices attached to the Manchester, Central Lancashire and North Cheshire Groups, the following programme of practical training is being carried out:—

Laboratory	4 months
Drawing office	3 months
Carbonizing department (including C.W.G.)	6 months
Fitting shop	1 month
Distribution department	6 months
Sales and service	2 months
Industrial	2 months

They are also given day release on one day a week to attend a technical college to receive instruction leading to the attainment of the Ordinary National Certificate in Mechanical Engineering or Chemistry. With the qualifications now required of student apprentices, exemption should be granted in respect of the first year of these courses, and by the completion of the two years' practical training in the various departments, the student should have obtained the Ordinary National Certificate in Mechanical Engineering or Chemistry. One of the great values of this initial two years' training period is that it enables both the Board and the apprentice to decide to which branch of the industry his particular attributes are most suited, and thus obviate what has happened so often in the past—a student becoming 'a square peg in a round hole.'

Not New, but Revolutionary

This system of training is not entirely new, although it is to some extent revolutionary in the gas industry. It has been usual for students not to be regarded as personnel who are acquiring knowledge, but as junior technical staff carrying out the routine duties. In many instances a student has, at the onset of his career, been placed in a particular department, only to remain there indefinitely because in his day-to-day work he has acquired a usefulness which makes the head of the department loath to lose his services while he receives additional practical experience elsewhere. At the completion of this two years' period of training, students will concentrate upon the particular branch chosen and consequently those who decide on chemistry will be given specialized training in laboratories, including the central laboratory. Facilities will also be granted for continuing the academic studies leading to the Higher National Certificate in Chemistry and eventually the Associateship of the Royal Institute of Chemistry. Those who are fitted for the sales and service department will be encouraged to obtain the Institution of Gas Engineers' Certificate in Gas Salesmanship and Consumer Service as a prelude to the British Institute of Management Course in management studies. Those whose interests lie in transport will, in the first instance, obtain their Higher National Certificate in Mechanical Engineering, followed by further study for the appropriate Examinations leading to the Associate Membership of the Institute of Transport. The draughtsmen will be advised to obtain the Associate Membership of the Institution of Mechanical Engineers, whilst those who are to be the future production, distribution and industrial staff will continue with their studies for the Associate Membership Examination of the Institution of Gas Engineers.

With the discontinuance of the Ordinary and Higher Grade Certificates in Gas Engineering—Manufacture or Supply—and the substitution by the Institution of Gas Engineers of the Associate Membership Examination as the only means by which students can obtain the necessary academic qualifications which are part qualification for Corporate Membership of the Institution of Gas Engineers, it became necessary for training methods to be reviewed. The Associate Membership Examination is now conducted jointly with the Institution of Civil Engineers and comprises the Common Preliminary Examination of the Engineering Joint Examination Board, Final Part I and Final Part II, Group VIII, which includes gas engineering, manufacture or supply.

It must surely be the ambition of all production and distribution students to obtain the Associate Membership Examination and eventually become Corporate Members of the Institution of Gas Engineers, but the standard is high and the way long and difficult. The Board are conscious of the arduous academic pathway which faces the student today and to help him attain his goal more quickly, have instituted a

A CENTURY OF PROGRESS

1855

Rose Mount Iron Works in 1855

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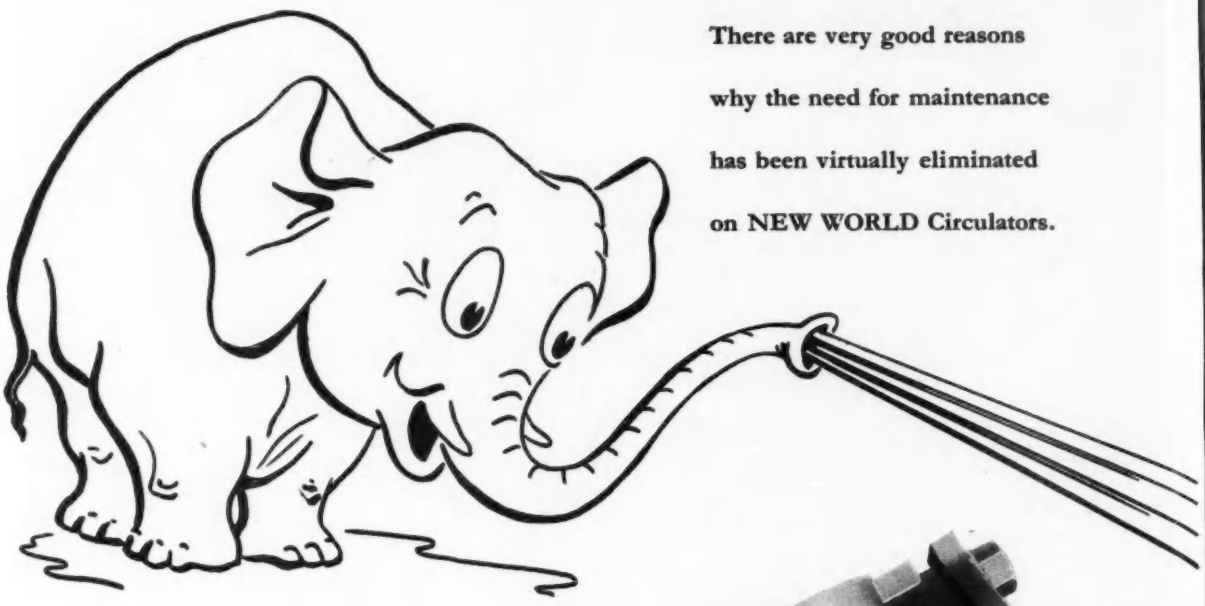

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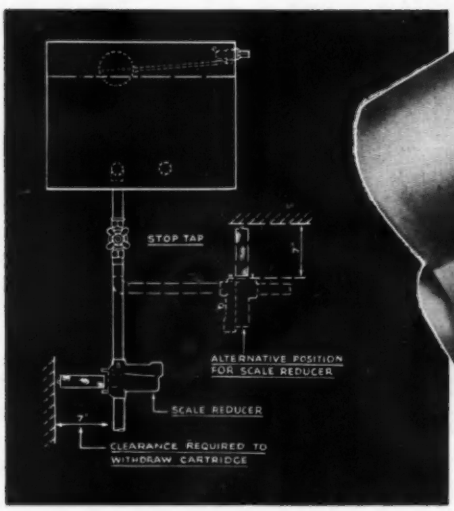

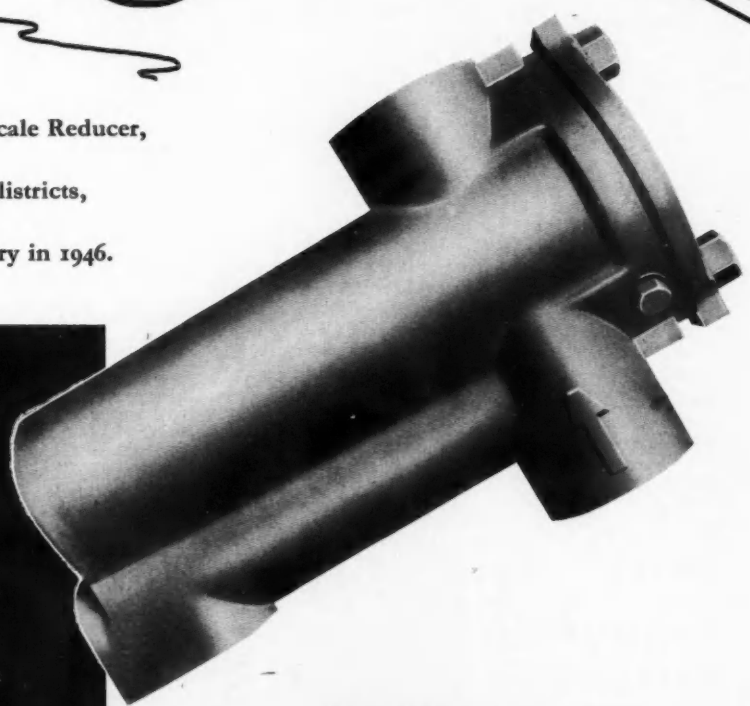

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three year college Associateship 'sandwich' course in gas engineering (production and distribution) at the Royal Technical College, Salford. This course entails full-time instruction for five days a week for six months in each of three years.

Students embarking upon this course will enter by way of three alternative streams, those possessing the Ordinary National Certificate in Mechanical Engineering, those possessing the Ordinary National Certificate in Chemistry, or those with the General Certificate of Education at Advanced level. Each stream will pursue a course of study designed to bring students to a common standard by the end of the first year. All students will continue with the same course during the second year of study, and at the end of the second year the main stream will be divided into two streams, one specialising in manufacture and the other in distribution. As the course is recognized by the Institution of Gas Engineers, its successful completion will give to holders of this college Associateship full exemption from the whole of the Associate Membership Examination of the Institution of Gas Engineers with the exception of the second paper in gas engineering—manufacture or supply. The student apprentices now being recruited should be capable of completing this very comprehensive 'sandwich' course successfully, thus enabling them to obtain their qualifications in a period of five years. Although I refer to the new student apprentices, present personnel are not excluded and any student who obtains his Ordinary National Certificate in Mechanical Engineering or Chemistry without failure en route will be considered for a place on this course. This has in fact been implemented this year, and 39 students are at present participating in the course now being conducted at the Royal Technical College, Salford. Those who are not fortunate enough to obtain a place will be required to continue their studies by way of the Higher National Certificate in Mechanical Engineering.

Details have been given regarding training and education of apprentice gas fitters and student apprentices, but only brief reference has been made to a very important section of the gas industry; one in which training and education can and will be a most essential factor. I refer to sales and service. A proportion of student apprentices will be attached to this branch of the industry and will receive specialised training. Apart from possessing suitable personal qualities, to be a salesman it is necessary to possess a considerable technical knowledge of the supply and uses of gas under varying conditions, in addition to having a sound training in salesmanship. A course has been designed by the Institution of Gas Engineers to enable salesmen and prospective salesmen to acquire this knowledge. The course recommended is the Certificate in Gas Salesmanship and Consumer Service course.

Another branch of the industry which is receiving special attention is the appliance maintenance section, on which depends the efficient operation of the many appliances to ensure satisfaction to the consumer. Appliance maintenance men will be given instruction in the operation and maintenance of water heaters, cookers, refrigerators and other appliances.

The administration side has not been overlooked, and facilities are granted for employees who wish to qualify by means of secretarial and accountancy examinations.

Those not aspiring to a professional qualification can increase their educational knowledge by undertaking a National Certificate Course in Commerce. A good shorthand-typist is also very essential to any organization, and junior female staff are encouraged to increase their efficiency by studying at one of the recognized Secretarial Colleges to prepare for the Royal Society of Arts Certificates in shorthand and typing, or alternatively to become proficient in the operation of calculating machines, etc. From time to time courses are arranged for junior home service advisers to enable them to become fully conversant with the operation of appliances.

Training and education does not necessarily apply only to staff employees, but to the manual workers as well. Although manual workers do not normally require academic qualifications, the possession of a certain degree of technical knowledge is desirable. With this end in view, foremen and others in supervisory capacities as well as technical assistants from the various works in the Manchester Group have been encouraged to attend a series of special lectures designed to give them an appreciation and a better understanding of the process of gas manufacture. Courses for mains and service personnel have been conducted in Manchester, Liverpool and Preston, and although primarily of a practical nature, they help materially to co-ordinate the work of the Distribution Department by standardization of the methods of approach.

So far I have dealt only with the facilities for training now existing and available to employees of the Board. There is, however, a wide and unlimited scope for further education within the industry. For example, the acquisition of a residential college would do much towards meeting the specialized need for short courses covering technical subjects (manufacture and distribution); scientific development within the industry; sales and service and industrial matters; administration; and in short every aspect of the industry. Again, training for foremen and supervisory staff is a matter which will have to be gradually developed as opportunities permit. This may eventually be introduced by the formation of discussion groups to consider such matters as general principles of business management, control of production, control of plant, planning and progression of work, elimination of waste and personnel management. Such a method may well provide the whole basis of training for the leadership required in the industry, and would be a means of broadening outlooks and ideas, and reviewing new methods and means of carrying out the job. There is also, as distinct from actual instruction in carrying out a particular job, the development of the skills of instructing, leadership, and improvement of methods. Courses for such development are conducted by trainers of the Ministry of Labour and National Service and are known as 'training within industry' courses.

There are many other methods of training which can and will be adopted in future to enhance our training programme, but from my brief resumé on this vital subject, it will be seen that concentrated efforts are being made to meet the training needs of every type of employee in the area.

UNDERGROUND PIPELINE CORROSION—*From p.170*

that if the pipe is maintained more electro-negative than −0.85 volts relative to a copper/copper sulphate half-cell, corrosion is prevented. In waterlogged conditions, where sulphate reducing bacteria exist, a minimum potential of −0.95 volt is necessary. The flow of current necessary to maintain this potential on the pipe will be a function of the area of the exposed metal and the electrolyte, *i.e.*, soil conditions.

The next step is to carry out a current drainage test to assess the amount of current necessary to depress the existing soil potentials to the value of −0.85 V. or −0.95 V. required for protection. To do this a temporary impressed current system is set up using storage batteries or a D.C. generator as a source of current. Pipe to soil potentials relative to various current inputs are measured along the line until the minimum required value is obtained. At present this trial and error method is the best means of correlating all the various factors which contribute to pipeline corrosion and it produces the most satisfactory design.

Economic Advantages of Cathodic Protection

The economic advantages of properly planned cathodic protection are normally obvious and require no emphasis. They cannot be dealt with in detail in a paper of this length, but the following information is indicative of the savings which can be made:—

(*a*) It has been estimated that a 1% improvement in anti-corrosion measures in the United States alone would mean a saving of some £19,000,000.

(*b*) It has been the experience of an American gas company that as a result of reduced corrosion brought about by cathodic protection it is practicable to use thinner-walled steel pipe in high pressure lines, which may mean a saving of anything up to 40% on the price of pipe, according to the size of pipe used.

By applying proper cathodic protection, the life expectancy of pipe lines may be considerably extended at a cost of less than 1% of the cost of the pipe. The cost of consumed current must be added to this, but it is small if cathodic protection is applied to a well-coated new pipeline, since there will be very little exposed bare metal area and little increase in the exposed area with time on account of the corrosion control.

It is evident, even from a few details like these, that the economic advantages of applying cathodic protection to most pipelines are very considerable.

Human Relations in Industry

Points from the discussion on the paper on 'Human Relations in Industry' presented to the Western Junior Gas Association at Bath, by Mr. Kenneth E. Stringer, Personnel Manager, and Dr. Kenneth P. Duncan, Chief Medical Officer, of the South Western Gas Board.

Mr. W. K. Tate, President of the Institution of Gas Engineers, said he had recently attended meetings of other junior gas associations where the mood seemed to be suitably summed up in Mark Anthony's words 'I come to bury Cæsar not to praise him,' because the poor old gas engineer was told at great length just how useless he was and always had been. 'Little do they know what varying factors you have to put up with,' said Mr. Tate. The gas engineer on the distribution and production side was someone who had to deal with changing circumstances, and he suggested that the engineer was, in fact, the most resilient and most adaptable person in any profession.

There were two facts to be borne in mind about human relations. First, they must have humanity; they must remember that the people with whom they were dealing were human beings, and that they had hopes and fears and troubles the same as they had themselves. Second, they must always do to others as they would be done by themselves. There was no finer text book on human relations and personnel management than the New Testament.

Men More Important than Machines

Mr. J. W. Denton (Torquay) said it was fitting that the presentation of the paper should have followed the presentation by the Chairman of the South Western Gas Board of the Presidential badge of office, and he thanked the Council of the Association for its invitation to divisional managers to become honorary members of the Association. He thought the paper had not set out to find an answer to the complex problem of human relations. If there was an answer he did not think that even Mr. Stringer and Dr. Duncan knew it, but what the paper had achieved was to set people thinking. He liked to approach the subject with the idea in mind that the men were more important than machines.

Mr. R. Miller (W. J. Jenkins & Co., Ltd., Bath), criticised the word 'drudgery' which the authors had used in connection with work. He thought the word 'drudgery' was the word used by Keir Hardie when we were told to 'throw off our chains.' He suggested that a better word would have been 'boredom.' Why was work a bore? Probably due not so much to the industry but to the fact that we now lived in a mass production age. The skills were giving way to mass production and the problem was to convince a man that the job he was doing was a necessary part of the whole.

Mr. Stringer, referring to the drudgery of dealing with routine jobs, said that field work experiments—the Hawthorn experiments—were now being carried out in the United States at Yale University, and in this country. It was being demonstrated that the rate of mass producing articles could be increased, no matter how routine the work. 'I do not think that the morale of any industry decreases merely because you de-skill the jobs and make them routine,' said Mr. Stringer. He and Dr. Duncan had been thinking principally in terms of heavy maintenance work, such as continually moving tons of coke. As a result of the evaluation of education an individual today was much more likely to get disgruntled with his job if he could not see the end purpose of it, and the only people who could make him conscious of this were the local management and officials.

Happiness Essential

Mr. T. B. Todd (Bath) said that he had been looking back over the past 100 years. The inanimate machinery of production had been progressively more efficient, and during the same period the human operative had become progressively more uncertain and more subject to external influences. It was, therefore, natural—and the paper showed the point—that managerial thought should concern itself with human relations to an increasingly greater degree. In the technical field there were relatively few problems left which, once they were clearly defined, could not be solved by the engineer or the scientists, or both. The problems that remained were chiefly human problems. The fact remained that a man worked best when he was happy, and in this connection Mr. Todd wished to consider happiness under four heads: first, the assurance of justice; second, the freedom from excessive personal worry; third, the freedom from frustration, and last, the satisfactory conditions of employment under justice. Industrial relations were only satisfactory when the employee was satisfied that within his employment he was receiving the same even-handed treatment which he would get as a citizen outside his employment. Mr. Todd continued: 'I think we have achieved in this country a political but not yet an industrial democracy. That is our aim, and the democracy of the individual is very largely the primary matter of justice. Industrial justice is something which must not only be done, it must be seen to be done.'

On the question of worry, Mr. Todd said that the welfare state as it was today was supposed to have removed many of the greater worries from the operative's shoulders. Nevertheless, he could still be rendered unhappy and, consequently, inefficient by extraneous worries such as, possibly, unhappy relations between wife and husband, allowances, accidents, death, or even debt. There were no standard procedures for dealing with such things as these, but industry could not afford to ignore them or pretend that they had no disincentive effect.

Frustration a Disease

Mr. Todd defined frustration as 'the industrial disease of the age,' arising from many factors, mainly when an employee feels that his job was not all that it might be and that it did not provide full scope for his intelligence. A man is a human being—an individual, and it was not right that he should be treated as a mere number on a clock card. Joint consultation was also necessary, because a man felt that he was an important and responsible individual if he was not denied the information to which he felt he was entitled.

Satisfactory conditions naturally depended on the character of the industry and they should be the best possible. It was important to remember that good mental conditions were more important than good physical conditions. A man hardened his head against bad physical conditions, but against bad mental conditions he hardened his heart.

Mr. Stringer stated that he did not accept that there could be an industrial democracy. He believed that any efficient organization in industry depended partly on the fact that an organization or an individual was prepared to pay someone who had a particular aptitude for doing a certain job of work in the way required. Industrial democracy was not practical—even 100 years advanced from now. Three things crystallized which the employee wanted were how to express his individuality, at least some of the time; the opportunity to expand and develop within an organization, if he demonstrated his worth; and justice—which Mr. Stringer preferred to call equity.

Mr. R. B. J. Smith (Bath) referred to the science of management and the remark in the paper that 'it may be that those with a scientific background are particularly at fault in this respect.' Mr. Smith suggested that nowadays there was quite a large background of scientific knowledge about, and this

might be an asset in dealing with human relations. He also mentioned consultation outside the industry to deal with particular black spots if this would benefit the conditions, particularly in connection with certain processes on the works.

Mr. Stringer said that the paper stated that a great deal of harm had been done to the natural development of relations in industry because of the steps taken by a certain organization to introduce an outside industrial psychologist.

Mr. W. E. Baggs (Bath) thought that there was a great change on the question of human relations, and it was not only in this field that the outlook was brighter.

An Industry of Good Relationships

Mr. Stringer appreciated the fact that the gas industry was inherently an industry of good relationships. The strike in the Midlands some years ago had been high-lighted owing to the fact that it was such an unusual occurrence in the gas industry. He would, however, like to throw a challenge on the table and say that such good relations existed because the gas industry was organized in local intimate communities. Nationalisation had changed that. Today people were in responsible positions controlling organizations far greater than any they previously had, and it was an accepted fact that it was necessary to look at a large organization differently. In the paper, Dr. Duncan and he had tried to show that every problem of management had a strong human element, and if this was considered first, the technical side of the problem might solve itself.

Mr. James Carr (Deputy Chairman, South Western Gas Board) said that in these days many heads of organizations were a long way from the personal contacts possible with individual undertakings, and it was necessary to think of the best way to get the message through the fellow down the line and to consider the proper human relations to the people they employed. They could not dissociate themselves just because they were somewhat removed. When Mr. Carr first came to Bristol he considered how he would deal with the situation. He decided that in the first two years he would try to remember 1,200 names so that he might have an introduction straight away.

Another approach was to find out all about a particular job oneself before criticizing. That approach went back to the first world war—to the individual soldier. The secret of being a good officer was to get to know your men—be human, and thus build up a proper understanding between yourself and the personnel with whom you have to deal from day to day. Show the men what part they are playing in the whole—it was wrong to think that one was doing the job on one's own and in that way one got nowhere. Mr. Carr outlined several war-time experiences in which he had to call for volunteers to undertake particularly difficult assignments. That the whole unit volunteered to go with him he attributed to the fact that he knew his men. He was with them, knowing what they had to do and the terrible implications behind it. Those principles could be applied to our daily life. They were little things but they meant so much. The problem could be approached from a right and a wrong angle. One could argue about terms and conditions, but if the men knew them they knew how to talk back to them and they could go a long way before there was a serious industrial dispute.

Cementing Friendships

Mr. W. B. Claridge (Swindon, Chairman of the South Western Section of the Institution of Gas Engineers) said that there had been some excellent contributions to the discussions on the paper and he thought everyone was agreed that human relations in industry was a very complex but a very necessary problem which had to be overcome to the best of their ability. 'Looking back over the years,' Mr. Claridge said, 'I see many who started with small concerns; a few in this room were members of the staff, a few stokers and fitters. Joint consultation as such was not known as it was today, but today this gave one the opportunity of getting to know the individuals, and incorporating one's own interpretation of matters into rules and regulations.' Mr. Claridge congratulated Mr. Stringer and Dr. Duncan on their approach to the problem of human relations, and said that he felt sure that when Dr. Duncan, who had recently joined the staff of the Board, had had an opportunity of visiting the works and the men had a better understanding of what had happened, it would do much to cement the friendship of all officers up to the Chairman, and he looked forward to happy human relations throughout the Board and in the industry in general.

Mr. Stringer concluded the discussion with a suitably amended version of Puck's final speech from 'A Midsummer Night's Dream.'

Mr. A. G. A. M. Gaston, of the scientfic staff, proposed a vote of thanks to Mr. Stringer and Dr. Duncan for a very stimulating afternoon.

EUROPEAN CHEMICAL INDUSTRY

In its report on the 'Situation in the European Chemical Industry,' the O.E.E.C. Chemical Products Committee finds that, taking member countries as a unit, production in this sector has increased during the last three years (1951-1953) at a rate substantially higher than the average for European industry as a whole. Progress since 1950 has been particularly impressive in Italy (57%), Germany (43%), Belgium (22%) and the United Kingdom (20%). The Committee points out, however, that this trend, though satisfactory in itself, must be viewed in the light of the world situation, which has greatly changed since before the war. At that time, production in the O.E.E.C. countries represented about 50% of world production; in 1951 it fell to about 25%, while United States production, which before the war amounted to 30% of world production, rose to over 40% in 1951.

After observing that the chemical industry is a complex of industries the report points out that the development was not uniform in the various sectors. Thus, the output of basic and intermediate products and of certain end-products such as plastics and synthetic detergents expanded considerably, whereas for other products it remained stationary or even declined—*e.g.*, in the soap industry. The chemical industry, which is normally a large scale producer, necessarily requires a wide market. The European industry has to face increasing competition both at home and abroad from the American industry, which has the advantage of a big domestic market. This is sufficient indication of the need for a free flow of trade among O.E.E.C. countries.

Trade among those countries could doubtless be expanded if the existing obstacles—quantitative import restrictions and customs duties—could be relaxed. The trade in chemical products at present subject to restrictions may be estimated at 20% of the total trade in 1952. The O.E.E.C. Chemical Products Committee considers that, in general, prospects in most sectors of the chemical industry justify a certain degree of optimism for the near future. The present economic situation, which shows a high activity in most sectors to which the chemical industry is a supplier, implies high activity in the production of chemicals as well.

JAMES WATT INTERNATIONAL MEDAL

The Council of the Institution of Mechanical Engineers has awarded the 1955 James Watt International Medal to Dr. Igor Ivan Sikorsky, of the United States, in recognition of his life's work in applying science to the progress of mechanical engineering through pioneering development of aircraft of various types: multi-engined, amphibians, and particularly helicopters. The James Watt International Medal was founded in 1936 to commemorate the bi-centenary of the birth of James Watt. In creating the award the Institution decided to commemorate an event which was destined to bring about a revolution in the utilization of power. In making the award the Institution has secured the co-operation of the principal engineering institutions and societies in all parts of the world as nominating authorities. The aim is to award the Medal to an engineer who has achieved international recognition both by his work as a mechanical engineer and by the ability with which he has applied science to the progress of mechanical engineering. The Institution recognizes, however, that it is only rarely possible to find men in whom these qualities are so equally balanced as they were in James Watt. It therefore considers men who have attained world-wide eminence in mechanical engineering in any direction—science and research, invention and production. Hence a great thinker or teacher, though he be not a designer or inventor, or a great organizer of production in engineering, is eligible for the medal.

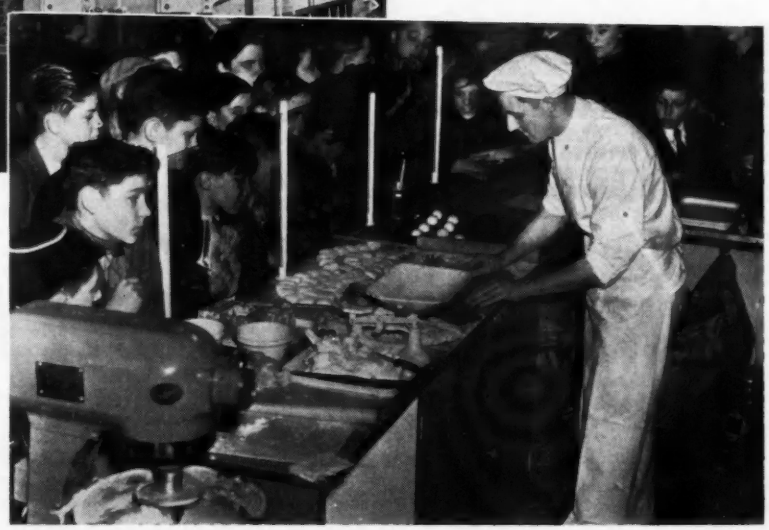
It Was Food All the Way for the Schoolboys

Lure of the Gas Council Exhibition Stand

As reported last week, the Gas Council's stand at the Schoolboys' Own Exhibition this year was designed to appeal to the juvenile stomach, with generous samples of doughnuts and Baked Alaska. On the left is a view of the stand, which attracted thousands of young people during the exhibition's 13-day run

Right: The crowds press closer to watch the demonstration of doughnut making and to watch fellow visitors being instructed in the art

On the left is the section of the stand devoted to the preparation of Baked Alaska—ice cream baked in meringue. This was demonstrated by J. Lyons & Co., Ltd., using the table top gas cookers shown in the photograph



Right: Embryonic doughnuts being shaped by an expert while eyes watch avidly and mouths water. Later there will be free samples and, since doughnuts are sticky things, a chance to wash one's hands in hot water efficiently provided by a gas water heater

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GAS CONSULTATIVE COUNCILS

Charges for Fixing Cookers

The question of a standard charge for fixing cookers was again discussed by the South Eastern Gas Consultative Council at its meeting at Caxton Hall, Westminster, on January 4, presided over by Councillor A. B. Constable. A number of complaints had been received from consumers, mainly within the Kent County Division, and while appreciating that approval had already been given to the Gas Board's standardized charge the Council had felt at a previous meeting that there was a case for re-consideration of the whole question, having regard to instances in which the connection for a cooker was a simple and straightforward matter occupying considerably less than 30 minutes per operation.

A resolution had been submitted to the Board asking for further information, and the Board's reply pointed out that a standard charge for fixing was desirable because (a) the consumer could be told in advance the amount that would be charged and (b) no time was lost or expense incurred in the preparation of estimates for individual jobs. The standard charge of 21s. applied to several types of appliance but was particularly appropriate for cookers because so many were fixed each year and because there was generally little variation in the work to be done. The charge of 21s. provided for fixing the cooker to an accessible gas point with not more than 5 ft. of piping and included the cost of a test of the gas installation and of the cooker, and if necessary the adjustment of the burners.

It was usually possible to find out from a consumer at an initial stage whether or not the standard charge would apply. If extra work was necessary it was charged for at the current prices for labour and material. If the principle of having a standard charge was accepted, the costs incurred could only be covered by basing the charge on the average cost of fixing a large number of cookers, and there would always be some jobs costing less than that average figure, and others costing more.

The Chairman said the Council had agreed as long ago as 1951 to accept the principle of a standardized charge but in view of the number of complaints received since that time it had felt that the matter should be further considered. The hope had been expressed that Mr. V. W. Stanton, the Board's Commercial Manager, would attend that meeting to discuss the matter with the members of the Council, but in a letter from Mr. R. H. Sandford Smith, Secretary of the Board, it was pointed out that as Mr. Stanton had attended a meeting of the Council as recently as October, 1953, no useful purpose would be served by his attendance at the present time.

There seemed to be a general feeling, said the Chairman, that where it was a simple case of screwing up a cooker to an existing point the cost should be divorced from the standard charge, and that the consumer should be charged, say, a modest 10s. 6d. for the job.

It was agreed that the question should be referred to the district committees of the Council.

Fish Friers' Tariff

Correspondence had taken place between the Council and the National Federation of Fish Friers concerning the possible introduction of a fish frying block rate tariff similar in structure but not in actual prices to that for the bread baking industry. A request had been made to the Board for such a tariff in place of the present arrangement under which fish friers paid the flat rate for the first 50 therms per quarter, and received a discount of 15% in respect of the next 350 therms, and 22½% in respect of heavier consumptions.

The Secretary explained that the new proposal involved only a small modification of the existing bread baking block tariff. Bakers paid 14d. per therm for the first 100 therms, and it was proposed that the fish friers should pay 15d. The Board, however, took the view that there should be no change in the arrangements.

A suggestion at a previous meeting that members of the Council should make themselves available to address women's and other organizations on the work of the Consultative Council had been followed by a circular from the Secretary to the organizations concerned. The replies received were, on the whole, not rejections, but at the same time not very encouraging. The organizations were now aware of the facilities available, and so far as Rotary International of Great Britain was concerned, local Rotary Clubs might be glad to call upon speakers from the Council from time to time.

Council to Debate Beaver Report

Presiding at the 52nd meeting of the North Thames Gas Consultative Council at Westminster City Hall on December 30, Councillor Edwin Bayliss, J.P., referred to the recent issue of the report of the Committee on Air Pollution presided over by Sir Hugh Beaver. The report, he said, contained many recommendations for alleviating and reducing air pollution which were of interest to the Council, and mentioned particularly the recommendations of the Committee in respect of (a) removal of purchase tax on gas and electric room and water heaters, and (b) the extended use in 'black areas' of coke and other smokeless fuels; the provision of improved appliances for burning smokeless fuels which can be recognized by some form of 'hall mark'; and the production of high quality free-burning coke which should comply with standards laid down by the British Standards Institution.

The Chairman said that although the Government had not yet declared its intentions with regard to the report, early action had been taken to implement some of the recommendations by Mr. G. Nabarro, M.P., who had used his right as a private member to introduce a Bill for 'securing in all connections the abatement of atmospheric pollution and smoke.' The Bill is due to be read a second time on February 4. Councillor Bayliss said that he felt sure all members were interested in the subject of air pollution and that it might be worth while to have a debate on the report to see if the Council could put forward any constructive representations.

After discussion, it was agreed that copies of the report should be obtained and issued to all members and that endeavours should be made to secure the attendance of a qualified speaker on air pollution and smoke abatement at the Council's meeting in February, when the report would be debated. The Chairman stated that the report was also being studied by the Board's technical officers and that it might be possible to obtain their views on the recommendations.

Rise and Fall Clause

It was stated that the Town Clerk of Wanstead and Woodford had asked the Council to take up with the Board the Board's refusal to amend the 'rise and fall' clause in the new street lighting agreement which was under negotiation. The Wanstead Council wished to amend the clause to provide for fixed percentage variation in the annual charge per lamp in the event of a decrease in the price of gas, but the Board had insisted on exercising its own discretion in such an event. The Town Clerk stated that his Council had been unable to obtain an adequate explanation for the Board's attitude.

The representation had been referred to the Board, which reported that the public lighting agreement in question was based on a special price for gas which was less than the flat rate and took account of savings that arose from this special type of supply. Before any reduction in the special price could be made it would be necessary to examine the factors that gave rise to the reduction in the flat rate to see how far they applied to the special price. For this reason the Board could not contemplate providing any automatic decrease in the charge made under the public lighting agreement.

The Board also pointed out that in the event of an increase in the flat rate price of gas the clause (as worded) did

not provide for an automatic increase but gave the Board a discretion subject to an upper limit not exceeding the amount by which the flat rate was increased. The Board stated that the clause to which the Wanstead Council objected had been the subject of long negotiation between the Metropolitan Boroughs Standing Joint Committee and and the North Thames and South Eastern Gas Boards and had finally been adopted as part of the standard agreement by the Standing Joint Committee. Committee.

The Chairman recalled that the question of price received by the Board for gas used for public lighting had been raised several times previously by members of the Council when the Board had explained the difficulty of providing a satisfactory clause to cover both increases and decreases in the price of gas as well as variations in the costs of lighting, maintenance, inspection and cleaning of the lamps, which were all included in the annual charge per lamp. He said that he felt that the most satisfactory compromise on this complex question had been reached by adopting for general use the clause agreed with the Metropolitan Boroughs Standing Joint Committee.

Freedom of Choice in New Houses

A member enquired as to the present position in regard to the negotiations at national level on the question of denial of 'freedom of choice' by means of a demand of a revenue guarantee by electricity boards from builders and developers of new estates.

The Chairman said agreement between the British Electricity Authority and the Gas Council had not yet been reached. The question had been discussed at the meeting of Gas Consultative Council Chairmen with the Parliamentary Secretary to the Ministry in September when the Minister had been urged to deal with the difficulty which was general throughout the country.

In the case of the Mount Farm Estate which brought the issue to light in the North Thames area, the Gas Board had laid the gas main and made a direct canvass of the occupiers of the new houses with successful results.

One member suggested that another reminder should be sent to the Minister to press for a settlement of the question, and another said he thought that matters might be hastened by each member of the Council sending to his own M.P. a letter setting out the Council's views.

It was agreed that the Chairman should raise the matter again at the next meeting of Council Chairmen.

Salvation of Nationalised Industries

'It is a great pity that so few people know of the functions of this Council. If people could not obtain satisfaction from the local gas manager, they could put forward their complaint to the Council,' Mr. A. Haslam Wood, Chairman of the East Midlands Gas Consultative Council, said at Nottingham on January 4. Since the Council was formed in 1949-50 it had dealt with some 300 complaints to the satisfaction of the consumers, an average of 50 a year. The Chairman commented that such councils were the salvation of nationalised industries.

Replying to Councillor P. Holland (Nottingham), who asked whether the Board would consider the inclusion of a local housing estate with the question of providing additional facilities for paying accounts in rural areas, Mr. Sydney Smith, Chairman of the East Midlands Gas Board, said these things cost money. They could not provide these facilities for every housing estate that went up. If they did provide such facilities, then the price of gas would have to go up. The Board's policy was to give the best service possible and the service during the past six years was better than it had ever been.

When the Sheffield and Rotherham Divisional Committee considered a circular dated October 1 last, issued by the Yorkshire Electricity Board to local authorities in its area, with reference to electricity supply to local authority houses, the Chairman of the Council said he had examined the figures quoted in relation to heat value and current costs of coal, gas and electricity, and it would appear they were incorrect.

The Chairman supplied committee members with copies of a statement of comparative charges for gas and electricity in respect of a five-roomed house and a 13-roomed house. Based on actual bills, the statement showed that, after allowing 50% loss of efficiency in gas compared with electricity suggested in the report of the Ridley Committee, 201 more efficient B.Th.U. per 1d. were obtained from gas than from electricity in respect of the five-roomed house and 1,100 more in respect of the 13-roomed house.

The committee resolved that in the interests of tenants of houses to be erected by local authorities in the area of the Yorkshire Electricity Board, the East Midlands Gas Board should be requested to consider the preparation of a statement to offset the misleading information contained in the circular.

Mr. Haslam Wood said the matter had been considered by all divisional committees.

Mr. Smith said the Board would act on the resolution and when a statement had been prepared, he saw no reason why it should not be circulated to Council members.

Mr. Smith indicated that the Board was considering appointing a public relations officer.

INSTITUTION OF GAS ENGINEERS

South Western Section

Mr. W. K. Tate, President of the Institution of Gas Engineers, and Mr. W. H. Bennett, formerly Chairman of Associated Gas and Water Undertakings and of the Taunton and District Gas Company, were principal guests at a general meeting of the South Western Section of the Institution of Gas Engineers at Taunton on January 12, presided over by Mr. W. B. Claridge (Swindon). The meeting was preceded by luncheon at the County Hotel, where Mr. Claridge warmly welcomed the guests.

MR. TATE, speaking at the opening of the meeting in the Demonstration Theatre of the Taunton undertaking, congratulated Mr. Claridge on his election as Chairman of the Section and said that in honouring him in that way the members had done no more than recognize his true worth. On such an occasion it was usual for the President of the Institution to convey more or less formally the greetings of the Council of the Institution, and he assured them that those greetings were much more than formal. The Council was interested in the progress, prosperity, and development of the district sections, which after all built up to the Institution as a whole, and the South Western Section was to be congratulated on the extent of its activities and the wide range of subjects dealt with at its meetings.

The Secretary, MR. E. V. DUNN, reported apologies for absence from Mr. C. H. Chester, Chairman of the South Western Gas Board, Mr. J. Carr, Deputy Chairman, Mr. J. W. Denton and Mr. H. H. Brown, Past Chairmen of the Section, and the chairmen and secretaries of other district sections.

The meeting confirmed the election of three new members: Mr. W. T. Lane (Area Publicity Staff), Mr. F. Tweedle (Swindon), and Mr. F. C. Gay (Bristol).

The main purpose of the meeting was to hear a paper under the title of 'Is the Balance of Industry Being Unduly Tilted by Emphasis on Education, Joint Consultation, and Welfare Services?' by MR. KENNETH E. STRINGER, Personnel Manager, and DR. KENNETH P. DUNCAN, Chief Medical Officer of the South Western Gas Board. Mr. Stringer was prevented by illness from attending, and the paper was therefore presented by Dr. Duncan. A report of the paper and discussion will be published in a later issue of the 'JOURNAL.'

A vote of thanks to the authors was moved by Mr. C. R. Ingham, Immediate Past Chairman of the Section. A vote of thanks was also accorded to the South Western Gas Board and the Taunton District for their hospitality and their arrangements for the meeting. The proceedings were followed by tea.

WHOLE (PUBLIC) HOUSE WARMING AT HAVANT

The latest application of Radiation whole house warming by gas is illustrated in this photograph of the 'Curlew,' Havant, claimed to be the first licensed house in the home counties to have central heating by ducted warm air. Two of the unobtrusive grilles are shown in the front of the bar, and the thermostat control gives an even temperature throughout the premises, the gas unit being located behind the door on the right of the picture.

Heavy Weather for Midland Juniors

Heavy weather in the Midlands—severe snow storms and high winds—made roads impassable and travelling hazardous on January 4 and not more than a score of members of the Midland Junior Gas Association attended the first meeting of 1955 at the Gas Offices in Edmund Street, Birmingham.

The President (Mr. H. J. Reynolds) travelled from Wolverhampton, but for the most part members came from within the city. A paper was to have been read by Mr. G. E. Brooke (Birmingham) on 'Some Functions of a Coal Test Works.' In the circumstances, it was agreed to postpone the paper until February 8. The paper due to be given on that date by Mr. F. Grocott (Birmingham) on 'Purification' was postponed until March 22. Last year a paper had to be postponed because of the prevalence of fog.

Mr. Reynolds says the Association has had to postpone only three papers in nine years on account of weather conditions.

Gas Board Vehicles in the Rugby district travel more than 100,000 miles a year between them, said Mr. A. E. West, Rugby District Engineer and Manager, when he spoke at the presentation of safe driving awards to eight employees at the Gas Showrooms, Rugby, recently. The drivers, each of whom received a diploma and cash bonus from Mr. G. J. Rimmer, Hinckley, were: H. Burdett (first year); C. E. Newcombe (third year); J. Clarke (fourth year); [illegible]. Gibbs (second bar to five years medal); and W. E. DeWitt (fourth bar to five year medal).

Awards to the Value of more than £3,000 for original inventions in the technical field have been made to six National Coal Board employees. The Board's Awards Scheme has been operating for nearly three years, and during this time some 30 inventions coming before the National Tribunal have been awarded sums amounting in all to £17,500. Inventors appearing before the Tribunal and Panels have come from every level of the industry.

Output from the Hendon and Ayre's Quay works of the Sunderland Division of the Northern Gas Board on January 11, reached the all-time record of 11,812,000 cu.ft., an increase of 18.9% over the corresponding day last year and 6½% above the previous highest total in December, 1953. Making this announcement, Mr. W. O. Kirkwood, General Manager of the Sunderland Division, said that the extra demand sprang from the fact that many more gas appliances were in use than in previous years, coupled with a sharp drop in temperature.

De La Rue & Co., Ltd., have arranged to manufacture under licence in France and Italy their gas-fired infra-red panels for space heating and process drying. The marketing in France has been entrusted to Société Pressoirs Colin, Rue Jean-Jacques Rousseau, Montreuil-Sous-Bois, Seine, and in Italy, to S.A.I.R.A., S.p.A., of Verona. An interesting innovation in France is the development of mobile space heating panels. These are mounted on a wheeled stand complete with bottled gas cylinder, and they have proved invaluable for the warming of buildings in infrequent use such as chapels and small workshops where the cost of a static installation would be impracticable. They are also very useful for giving on-site demonstrations to potential customers.

Diary

Jan. 20.—MIDLAND JUNIORS: Visit to The Jeavons Engineering Co., Ltd., Tipton.

Jan. 20.—INSTITUTE OF FUEL: 'The Beaver Report,' Discussion to be opened by Dr. G. E. Foxwell, at the Institution of Civil Engineers, Great George Street, 5.30 p.m.

Jan. 20.—LONDON JUNIORS: Visit to a coal mine in the Cannock area.

Jan. 22.—WESTERN JUNIORS: 'Industrial Development in the Rural Areas,' E. I. Luscombe. Exeter.

Jan. 26.—EASTERN JUNIORS: 'Steam Utilization in the Gasworks,' G. S. Hall. Cambridge.

Jan. 27.—NORTH THAMES G.C.C.: Gas Industry House, 2.30 p.m., followed by showing of North Thames Gas Board's latest films in the Gas Council's new cinema.

Feb. 1.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster. 11 a.m.

Feb. 1.—LONDON AND SOUTHERN SECTION, I.G.E.: Postponed discussion on 'Atmospheric Pollution,' introduced by Dr. G. E. Foxwell; Bishop Partridge Hall, Church House, Westminster (entrance in Great Smith Street), 2.40 p.m.

Feb. 2.—MANCHESTER JUNIORS: Visit to English Steel Corporation, North Street Works. 'Use of Fundamental Data in Gasworks Plant Design,' R. Pollard.

Feb. 4.—LONDON JUNIORS: 'Burner Design,' J. Prigg. 178, Edgware Road, London, W.2. 6.30 p.m.

Feb. 8.—MIDLAND JUNIORS 'Some Functions of a Coal Test Works,' G. E. Brooke. Birmingham.

Feb. 9.—YORKSHIRE JUNIORS: Visit to Stoves, Ltd., Rainhill.

Feb. 11.—SCOTTISH JUNIORS (WESTERN): 'Ubique,' F. D. Southwell. 522, Sauchiehall Street, Glasgow, C.2, 6 p.m.

Feb. 12.—SCOTTISH JUNIORS (EASTERN): Meeting at Falkirk.

Feb. 14.—PURCHASING OFFICERS' ASSOCIATION (LONDON BRANCH): "Some Aspects of the Modern Law of Contract,' J. S. Barnes, Solicitor, North Thames Gas Board.

Feb. 14.—WALES AND MON. JUNIORS (SOUTH): Visit to Smith Crisps, Ltd. 'Planning for Thermal Efficiency,' K. H. Langford.

Feb. 15.—LONDON AND SOUTHERN SECTION, I.G.E. 'Development of By-Products Works at Tottenham,' H. Wadsworth. 17, Grosvenor Crescent, London, S.W.1, 2.40 p.m.

Feb. 16.—LONDON JUNIORS: Visit to R. & A. Main, Edmonton.

Feb. 18.—MIDLAND SECTION, I.G.E.: Spring Meeting, Queen's Hotel, Birmingham.

March 1.—EAST MIDLANDS G.C.C.: Victoria Station Hotel, Nottingham. 11.30 a.m.

March 2.—SOUTHERN G.C.C.: Reading.

Keith Blackman Cut-off Valve*

The Keith Blackman lock-shut pressure cut-off valve is dealt with in the Industrial Gas Development Committee's report No. 574/54, now published. Only a 1¼-in. prototype valve has been examined, but when this valve is in production a size range of 1 in. to 3 in. B.S.P. inclusive will be available.

Its function is to prevent negative pressures occurring in gas mains by the continued use of boosters, compressors, gas engines, etc., in the event of there being a low mains pressure. Once it has operated under low pressure conditions, it then requires restoration of the inlet pressure and re-setting manually before normal gas pressure can be restored at its outlet.

This range of valve is designed to fulfil a specialized function and it is not expected that the gas industry's requirements will be very large in numbers. In view of this, the manufacturers do not propose keeping stocks but will manufacture valves against specific orders. The valves are, of course, suitable for use with other gases than town gas, provided that they do not contain corrosive constituents and are not liable to affect the leather diaphragm.

The Keith Blackman valve

The valve in the main gas way is carried on a spindle which extends both above and beneath it. The lower portion of the spindle extends down through the base of the gas way and is sealed by a small leather diaphragm. A second, larger, diaphragm is fitted beneath this and provision is made in its cast housing to vent its supper surface to atmosphere and internally to connect the inlet gas pressure to its under surface. A spring which can be variably loaded bears on the lower end of the spindle. The upper part of the spindle extends through the top of the valve casting, where it is sealed with another small diaphragm, and its upward movement is controlled by the position of the locking cam. The spring-operated cam is enclosed in a cylindrical cover which is secured by a bayonet fixing.

The prototype valve was made of various metals, but it is understood that the production models will be of cast aluminium alloy in some cases and cast iron in others with the appearance shown in the illustration. All fittings will be of brass.

The inlet gas pressure is conveyed to the chamber beneath the large main diaphragm which, with adequate pressure, causes the diaphragm to rise and with it the central spindle. This movement opens the main gas valve provided the locking cam at the top of the spindle is held to one side so that movement is unrestricted. With the valve open the straight face of the cam lies along the side of the spindle.

Reduction of the inlet gas pressure to a value less than the predetermined operating pressure causes the diaphragm to drop and with it the valve closes. To ensure that the gas will not be restored uncontrolled on the outlet side of the valve the cam is released by the falling spindle. It then swings across the top of the spindle and locks the valve shut, its formation assisting in pressing the valve on to its seat.

Upon restoration of the inlet gas pressure the following order of operation will be necessary:—

1. Ensure that all cocks on the outlet side of the cut-off valve are closed.
2. Remove the cylindrical cover from over the cam.
3. Swing the cam away from the spindle so that the valve may rise.
4. Replace cam cover.
5. Carry out the required lighting or starting operation to the appliances affected by the valve.

The small sealing diaphragm on the upper part of the spindle prevents any leakage of gas from the valve housing to atmosphere while the cam cover is removed for resetting. The operating pressure will be set by the manufacturer on the instructions received with the order. This adjustment is obtained by weighing on the main diaphragm with the final adjustment of the spring loading at the base of the spindle.

Tests on the prototype valve showed that with a pressure drop of 0.3 in. w.g., 550 cu.ft. per hour of gas with a specific gravity of 0.5 could be passed. There was no let-by of the valve at 12 in. w.g. pressure. The shut down pressure range was 0.1 to 1.5 w.g. The sample valve was considered to be satisfactory, and it is not expected that the production valve will differ greatly from the one examined.

* Reproduced from report No. 574/54 of the Industrial Gas Committee of the Gas Council. (Information supplied by the North Thames Gas Board).

O.E.E.C TO STUDY ENERGY PROBLEMS

M. Louis Armand has agreed, with the approval of the French Government, to carry out an enquiry, on behalf of O.E.E.C., on current energy problems in Europe. Concern is felt at O.E.E.C. about the possible effects of a continued rise in energy production costs on the evolution of the European economy, the financial stability of member countries and the living standards of their populations. The Organization therefore wishes to study these problems in detail and to decide how they should be dealt with both on the national and on its own inter-governmental level. M. Armand, who is well known as President of the International Railways Union, is also an expert of international repute in energy matters.

As the administrator of an undertaking which is a large consumer of energy, he is a member of numerous French organizations dealing with energy policy—the Commission du Plan de Modernisation, the Conseil Supérieur du Pétrole, and the Comité Industriel de l'Energie Atomique, of which he is Chairman. It is likely that his enquiry will take several months to complete. M. Armand will make his report to the O.E.E.C. Council through the Organization's Secretary-General.

BRUSSELS INTERNATIONAL EXHIBITION.—Britain is to take part in the Brussels International Exhibition of 1958, the first major international exhibition for nearly twenty years. It will cover an area of more than 450 acres and will have an extensive industrial section. Preliminary details are available from: Campbell-Johnson, Ltd., 35, Old Bond Street, W.1.

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APPOINTMENTS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18–64 inclusive or a woman aged 18–59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

DRAUGHTSMEN required, preferably with experience in Steel Structures, Pipework, Foundations or Refractories. Write, stating full particulars and salary required to: The Chief Draughtsman, Furnace Department, The Wellman Smith Owen Engineering Corporation, Ltd., Parnell House, Wilton Road, London, S.W.1.

A LARGE Constructional Engineering Company in Midlands requires in its Drawing Office an experienced SECTION LEADER age 35/55 who would also act as deputy to the Gas Engineer. Applicants who should have had experience in Gasholder and general platework design will find this post of executive status a fine opportunity with good salary and pension scheme. Applications in strict confidence with full particulars of present employment and experience should be addressed to Managing Director, No. 222, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

WEST MIDLANDS GAS BOARD

WOLVERHAMPTON AND DISTRICT DIVISION
DRAUGHTSMAN—
DIVISIONAL DRAWING OFFICE

APPLICATIONS are invited for the above position, which is located at Dudley.

Candidates must have had good mechanical and structural experience and a knowledge of Gas Works requirements would be an advantage.

The salary will be within Grade 7 (£585–£665 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable and the successful candidate may be required to pass a medical examination.

Applications, stating full details of age and experience, together with the names of two referees, should be addressed to Mr. Stanley Jones, Divisional General Manager, West Midlands Gas Board, Wolverhampton and District Division, Kensington House, Bath Street, Dudley, to reach him within fifteen days of the appearance of this advertisement.

J. C. INGRAM,
Secretary to the Board.

EAST MIDLANDS GAS BOARD

LEICESTER AND NORTHANTS DIVISION
GOVERNOR MAINTENANCE FOREMAN—
LEICESTER

APPLICATIONS are invited for the appointment of a GOVERNOR MAINTENANCE FOREMAN to the Leicester Undertaking. The grade for this post is Intermediate III (£415–£460 per annum) with Class 2 Conditions of Service. The commencing salary will be in accordance with the ability and experience of the person appointed.

The Governor Maintenance Foreman will be in charge of a small team of governor maintenance men and the governor repair shop and, in addition, will supervise street lighting maintenance in certain county areas adjacent to Leicester.

Applicants should be experienced in the installation, operation and maintenance of all types of governors and ancillary equipment and should be familiar with the maintenance of public street lighting. Ability to drive a van is essential.

Applications stating age, present position, experience, and other relevant information should be addressed to reach the undersigned not later than Saturday, January 29, 1955.

H. B. TAYLOR,
Divisional General Manager.

Millstone Lane,
Leicester.
January 13, 1955.

EAST MIDLANDS GAS BOARD

APPOINTMENT OF
PUBLICITY ASSISTANT

APPLICATIONS are invited for the position of PUBLICITY ASSISTANT in the Department of the Commercial Manager at Board Headquarters.

The salary will be within Grades A.P.T. 8 and 9 (£625 to £755 per annum) of the National Salary Scales for Gas Staffs.

The appointment presents a good opportunity for a young man who can combine enthusiasm with a critical approach to the work of advertising agents and willingness to share in routine work. Preference will be given to candidates with agency experience, a knowledge of the production side of advertising and useful ideas on layout work.

The position is pensionable and the successful candidate will be required to pass a medical examination.

Applications, giving details of education, training qualifications and experience, together with the names and addresses of two referees, should be addressed to the undersigned to arrive not later than February 1, 1955.

A. GWYNNE DAVIES,
Secretary.

Beverley House,
University Road,
Leicester.
January 10, 1955.

WALES GAS BOARD

SWANSEA UNDERTAKING
APPOINTMENT OF
SENIOR TECHNICAL ASSISTANT—
DISTRIBUTION

APPLICATIONS are invited from suitably qualified persons for the above appointment for which the salary will be within the range of Grade 7 to 8 A.P.T. (Provincial 'A')—£585–£705 commencing at a figure commensurate with qualifications and experience.

Applicants should be experienced in Modern High/Low Pressure Gas Distribution Practice, including mainlaying and planning, and in the control of Distribution personnel.

The successful applicant will be required to pass a medical examination (if not already a member of a Gas Board Pension Scheme) and to join the Wales Gas Board Pension Scheme.

Applications stating age, experience, professional qualifications and particulars of training, together with the names of two referees, should be received by the undersigned not later than January 31, 1955.

A. PICKARD,
General Manager and Engineer.

Gas Offices,
Oystermouth Road,
Swansea.

WALES GAS BOARD

PONTYPOOL UNDERTAKING
TECHNICAL ASSISTANT/
RELIEF SHIFT SUPERINTENDENT

APPLICATIONS are invited from suitable young men between the ages of 20/25 to be trained for the above appointment.

Applicants should have had previous experience in the laboratory of a Gas Works, and/or be conversant with the control of Gas Works Plant. The person appointed will normally be employed in the laboratory but will be required to act as Relief Shift Engineer during holidays or sickness of Shift Superintendents.

The commencing salary will be within Grade A.P.T. 4 with placing according to qualifications and experience.

The successful candidate may be required to pass a medical examination and if eligible to subscribe to the Board's Staff Pension Scheme.

Applications, stating age, education, qualifications, and experience, with the names of two referees, should be forwarded to the General Manager, Wales Gas Board (Pontypool Undertaking), Gas Offices, Hanbury Road, Pontypool, Monmouthshire, not later than Tuesday, January 25, 1955.

CITY COUNCIL OF SINGAPORE

GAS DEPARTMENT

APPLICATIONS are invited for the post of SHIFT ENGINEER in the City Gas Department on 3 years' agreement in the first instance. On satisfactory completion of the agreement the appointee would normally be offered emplacement on the permanent establishment.

Applicants must be about 30 years of age and must be good practical carbonizers, well experienced in the operation and maintenance of Horizontal Retorts, Carburetted Water Gas Plants and normal Gas Works Auxiliary Plant, including Fiddes Aldridge Charging Machine, Mono Rail Telpher, Steam Boiler, Electric Generating Plant, Purification Plant, Exhausters, Compressors, etc. They must be capable of controlling operational labour and of maintaining efficient and maximum production of Coal and Water Gas and should also be familiar with the control of heats and the keeping of operating records. They should have had several years experience in the running of the plants as detailed above and must have held reasonably responsible and similar posts in fair sized Gas Works elsewhere.

The salary offered is either $550, $590 and $630 or $590, $630 and $670 for the 1st, 2nd and 3rd year respectively in the salary scale $550 × A40-1,070 depending upon the appointee's age, practical knowledge and experience. Expatriation and Cost of Living Allowances are also payable.

If placed on the permanent establishment after satisfactory completion of the Agreement the basic salary will be either $670 or $710 per month in the scale $550 rising to $1,070 per month (£770 to £1,498 per annum).

Expatriation Allowance payable is £287 per annum on basic salary between $550 and $750 a month, £315 per annum on basic salary between $751 and $870 a month, £343 per annum on basic salary between $871 and $1,000 a month, and £385 per annum on basic salary between $1,001 and $1,070 a month.

Cost of Living Allowance payable at present is £238 per annum on basic salary between $550 and $910 a month and £224 per annum on basic salary between $950 and $1,070 a month for a single man; £315 per annum rising to £382 4s. per annum on basic salary between $550 and $790 a month, and £385 per annum on basic salary between $830 and $1,070 a month for a married man; £412 6s. per annum rising to £549 10s. per annum on basic salary between $550 and $830 a month and £560 per annum on basic salary between $870 and $1,070 a month for a married man with one or more dependent children. A dependent child means an unmarried child, including a stepchild or a legally adopted child, under the age of 17, or receiving full-time educational instruction and below the age of 21.

For a single man the minimum total emoluments on a basic salary of $550 a month would amount to £1,295 per annum; for a married man with no children £1,372 per annum and for a married man with one or more children £1,469 6s. per annum.

The exchange rate is approximately $1 to 2s. 4d. sterling.

Partly furnished quarters provided if available at 6% basic salary or Housing allowance of 10% of basic salary (subject to a maximum of $120 per month) paid in lieu.

Free passages will be provided for appointee, his wife and his own children under the age of 12 years at the date of sailing subject to a maximum of three full passages.

One month leave per year of service may be granted on satisfactory completion of agreement at the discretion of the Council. If placed on the permanent establishment on completion of the agreement the appointee will be required to serve a further year before proceeding on leave. The present rate of leave is 4 days per month of resident service. Local leave is also granted.

Compulsory Provident Fund contributions at present 7½% of salary (but not allowances) to which the Council donate 7½% rising to 10% after 10 years' service, 15% after 15 years' service, and 20% after 20 years' service. This scheme is under review.

Applications in DUPLICATE giving full personal and technical information with *copies* of 3 recent Testimonials also in duplicate to Messrs. Allen & Williams, (Agents to the Council), 1, Victoria Street, London, S.W.1, before Tuesday, February 15, 1955.

(*Classified advertisements continued on page* 186)

APPOINTMENTS VACANT (ctd.)

PLANNING and Development Engineer with experience in Gas Heating and Cooking Appliances required by old established Company in the Midlands. Contributory Pension Scheme in operation. Application stating age, education, experience and salary required should be addressed to: No. 221, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

NORTH THAMES GAS BOARD

PRODUCTION ENGINEERING ASSISTANTS

A LIMITED number of vacancies exist for PRODUCTION ENGINEERING ASSISTANTS at some of the Board's works.

Applicants, preferably between 25 and 30 years of age, should possess a suitable University Degree, or be Associate Members of the Institution of Gas Engineers, or hold an equivalent qualification. They should also have sound practical experience of gas manufacture and ancillary processes.

Starting salaries will be within the range £655 to £845 per annum, according to age, qualifications and experience, and there are prospects of promotion to higher appointments. The successful candidates will be required to be members of the Staff Pension Scheme.

Applications, giving age and full details of qualifications and experience, should be sent to the Staff Controller, North Thames Gas Board, 30, Kensington Church Street, London, W.8, to reach him by March 12, 1955, quoting reference 666/219.

SCOTTISH GAS BOARD

FIFE GROUP
DUNFERMLINE DISTRICT
DISTRIBUTION TECHNICAL ASSISTANT

APPLICATIONS are invited for the position of DISTRIBUTION TECHNICAL ASSISTANT.

Candidates in applying should state Technical qualifications, giving details of previous experience including use of Town Gas for Industrial purposes, the preparation and carrying out of low, medium, and high pressure distribution schemes.

The salary will be on Provincial 'A', Grade VI (£530 to £610).

Candidates who may not have technical qualifications but are qualified draughtsmen might be considered for the position provided they are willing to learn technical distribution practice.

Applications to be sent in to undersigned not later than January 27, 1955, with *copies* of Testimonials or the names of two persons to whom reference can be made.

The position is superannuated and the successful candidate will be required to pass a medical examination.

DAVID L. DICKSON,
Group Manager.

Gas Works,
Grange Road,
Dunfermline.

SOUTHERN GAS BOARD

EASTERN DIVISION
PORTSMOUTH, GOSPORT AND BOGNOR REGIS GAS UNDERTAKING
HOME SERVICE ADVISER

APPLICATIONS are invited for the position of HOME SERVICE ADVISER from ladies holding a recognised qualification in Domestic Science and who are fully conversant with the organisation of cookery and other demonstrations.

The salary will be within Grade A.P.T. 3, Provincial 'A', £268-£404, according to experience and qualifications.

The successful candidate will be required to pass a Medical Examination and, unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

Applications, stating age and giving full particulars, should be submitted to the undersigned not later than January 31, 1955.

H. M. LAWRENCE,
Engineer and General Manager.

SOUTHERN GAS BOARD

SOUTHERN GROUP, CENTRAL DIVISION
SALES MANAGER

APPLICATIONS are invited for the appointment of SALES MANAGER to the Southern Group of the Central Division, with Group Offices at Aldershot, at a commencing salary in the region of £1,000 per annum.

Applicants must have had extensive and successful experience in promoting the sales of gas, coke and appliances and must be capable of controlling the sales staff and directing publicity.

The successful candidate will be required to pass a medical examination and, unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme.

Applications stating age, education, qualifications, training, experience, present appointment and salary, together with a one-page summary of these particulars, should be sent in an envelope marked 'Sales Manager' to the Secretary, Southern Gas Board, 164, Above Bar, Southampton, to reach him not later than February 4, 1955.

SOUTHERN GAS BOARD

NORTHERN GROUP, CENTRAL DIVISION
SALES MANAGER

APPLICATIONS are invited for the appointment of SALES MANAGER, to the Northern Group of the Central Division, with Group Offices at Reading, at a commencing salary in the region of £1,000 per annum.

Applicants must have had extensive and successful experience in promoting the sales of gas, coke and appliances and must be capable of controlling the sales staff and directing publicity.

The successful candidate will be required to pass a medical examination and, unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme.

Applications stating age, education, qualifications, training, experience, present appointment and salary, together with a one-page summary of these particulars, should be sent in an envelope marked 'Sales Manager' to the Secretary, Southern Gas Board, 164, Above Bar, Southampton, to reach him not later than February 4, 1955.

NORTH WESTERN GAS BOARD

APPLICATIONS are invited for the following two pensionable appointments :—

MANCHESTER GROUP
DRAUGHTSMAN—DISTRIBUTION DEPT.

Salary within Grade A.P.T. 7—£585-£665 per annum.

Applicants should have a knowledge of the design and layout of distribution plant, including boosting and governor systems and the maintenance of plan records.

Detailed applications, endorsed "Draughtsman—Distribution," giving the names of two referees, should reach the General Manager, N.W.G.B. (Manchester Group), Town Hall, Manchester, 2, within fourteen days.

NORTH CHESHIRE GROUP
SALESMAN-IN-CHARGE—
HYDE SERVICE CENTRE

The salary will be within Grade A.P.T. 4 (£335-£525 per annum) according to ability and experience.

Applicants must have had experience of showroom management and sales, and preference will be given to holders of the Institution of Gas Engineers Certificate in Gas Salesmanship and Consumer Service.

Detailed applications, giving the names of two referees, should reach the General Manager, N.W.G.B. (North Cheshire Group), Gasworks, Portwood, Stockport, within fourteen days.

MANCHESTER GROUP
TURBO-ALTERNATOR ATTENDANTS—
PARTINGTON WORKS

Shift Attendants are required for the running of two 2375 kW 6.6 kV Turbo-Alternators at the above works.

Applicants should have experience in the running of turbo-alternators and auxiliary plant.

Housing accommodation will be available at a later date and at a reasonable rental.

The rates of pay and conditions of service are governed by the N.J.I.C. for the gas industry and the North Western Area J.I.C., the present rate being 33s. 11½d. per shift (£11 17s. 8½d. for 6 shifts worked).

Detailed applications should reach the General Manager, N.W.G.B. (Manchester Group), Town Hall, Manchester, 2, within fourteen days.

MORLEY PRODUCTS (PADIHAM) LTD.

INVITE applications from suitably qualified persons for the following appointments.

SALES REPRESENTATIVE

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DOMESTIC LAUNDRY ADVISER

To tour the United Kingdom co-operating with Gas Board Sales and Home Service personnel to promote sales of Domestic Laundry Appliances and give local demonstrations to the public.

Applications for the above posts should give details of training, experience, age and commencing salary required. All expenses will be paid and a contributory pension scheme is available. Letters should be endorsed 'Sales Representative' or 'Domestic Laundry Adviser' as applicable and addressed to The Sales Director, Morley Products (Padiham) Ltd., 6-7 Russell Gardens, London, W.14.

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   - DOMESTIC GAS APPLIANCES
   - DOMESTIC SOLID FUEL
3. DISPOSAL OF WASTE LIQUORS PRODUCED IN GAS WORKS AND COKE OVENS (2 lectures)
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LANCASHIRE

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One—21 ft. long × 7 ft. 6 in. dia. × 100 lbs. working pressure. Hand fired.

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Cochrane No. 10 vertical mul itubular, coal fired, 12 ft. 3 in. high × 5 ft. 6 in. dia. × 100 lbs. working pressure. Evaporation approx. 1,620 lbs. per hour.

Vertical coal fired, cross tube, 12 ft. × 6 ft. × 100 lbs. working pressure.

Vertical coal fired, cross tube, 8 ft. 6 in. × 4 ft. 0 in. 100 lbs. working pressure.

Vertical coal fired, cross tube, 8 ft. 5 in. × 4 ft. 6 in. 120 lbs. working pressure (new).

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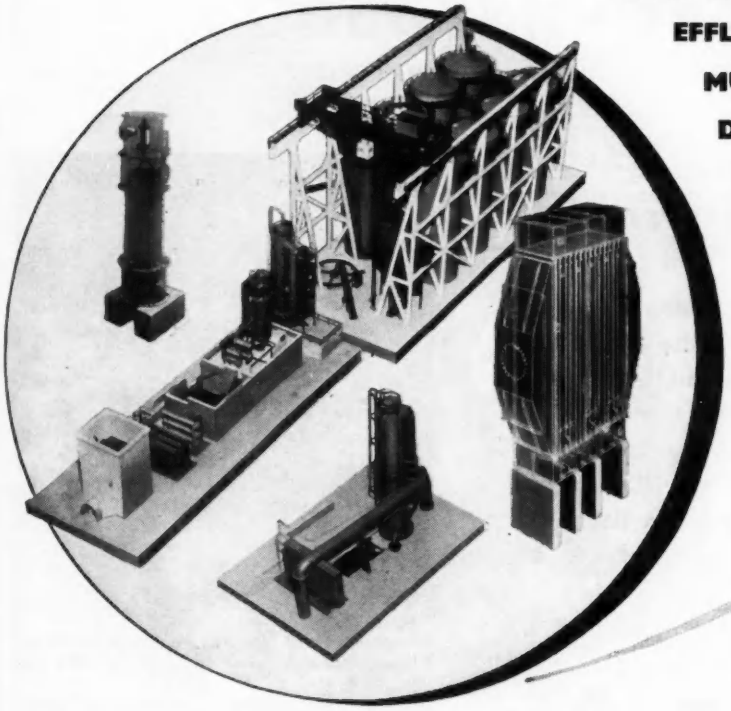

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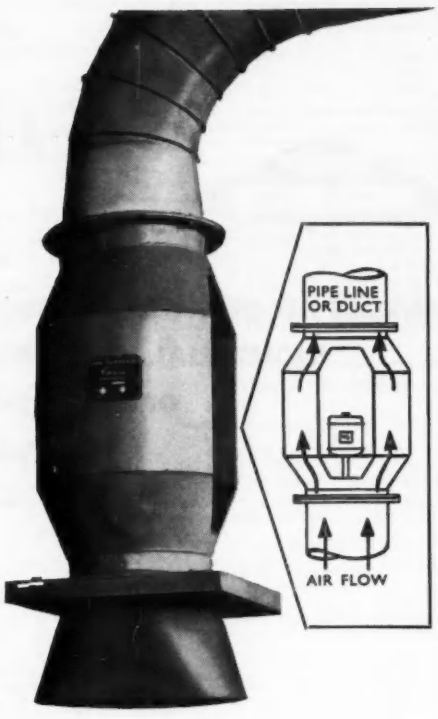

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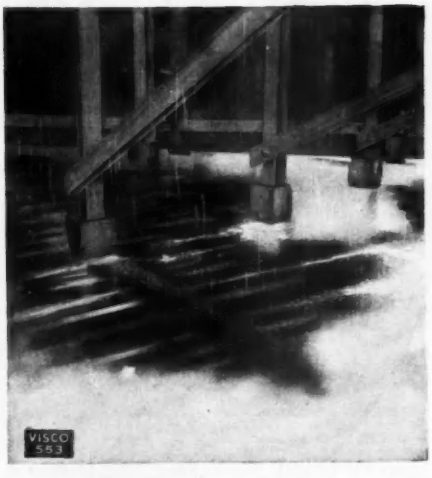

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